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THE EFFECT OF HIGH HEATS ON THE ILLUMINATING POWER OF GAS.

The attention which has been given to the study of retort furnaces during the last five years has resulted in furnishing some very interesting data relative to retort house practice. Gas managers are better posted to-day than they ever have been before in regard to the quantity of coke used in heating the retorts, particularly in this country. We know how our work compares with the results obtained by our friends across the ocean. It is not, however, with the coke used in heating benches, nor the comparative results obtained in the different countries, that we have to do to-day, but with a side issue—one of those questions which has been indirectly raised by the study of generator and regenerator furnaces, viz., the effect of high heats on the illuminating power of the gas.

From the earliest days of gas engineering it has been held that a high heat was destructive to the illuminating power of gas, the richer hydrocarbons being broken up into homologues of lower grade, an increased yield of poorer gas being the result. The question then before us is, "Is this time-honored opinion correct—do high heats necessarily mean poor gas?" That the richer hydrocarbons contained in coal gas can be broken up, by heat, into gases of less luminiferous value, will not, we presume, be gainsaid; but that does not wholly answer the question, it does not prove that a poor gas must necessarily result where a high yield is taken.

It is just here we would pause to note the value of the experiments which have been carried on in connection with generator furnaces of late, and to which we referred at the opening of this article; for the results obtained from these practical experiments—we may term them such, for they are results obtained in actual daily working, but wherein the facts have been noted with the utmost precision—prove pretty conclusively that a poor gas is not the necessary concomitant of high heats. In this country the Dieterich furnace is the only generator for heating retorts which has been sufficiently tried to form a reliable basis to figure on. If we take the results obtained by the use of this furnace, whether at Providence or Baltimore, we will find that with it the same or higher yield has been taken, and the gas is of higher power, or what is equivalent, the gas is of equal candle power, and, at the same time, less cannel coal is used.

If we turn to that interesting paper, prepared by Mr. Slater, for the last meeting of the American Gas Light Association, we will find our assertions on this score fully verified. The paper in question may truly be called the record of a practical experiment, being a record of a run of 176 days with the Dieterich furnace, contrasted with the results obtained in a similar period when the common or old style furnaces were used. What do we find here that bears upon the question at issue? With the saving of labor and coke we have not now to do. The point with which we are now concerned is this, that practically in each case the same yield of candle feet was taken; but when the common furnace was used, 11.72 per cent. of cannel was employed, while when the Dieterich furnaces were brought into action the enricher was dispensed with.

In the first place this substantiates the statement we made that higher heats are obtained with this generator, for the extra yield of the cannel employed in the one case would show that—leaving the question of candle power out of the consideration for the present—the yield from the caking coal was some 200 feet less per ton when the common furnaces were used than when the generators were employed.

The yield of gas per retort is further corroborative evidence on this point. We have been to the trouble of dilating thus on this part of the question, because it might be inferred, at first sight, that as the yield per ton in each case was about the same—or, more correctly, 100 feet in favor of the common furnaces—that the Dieterich furnaces were not, as a matter of fact, run at a higher heat. If we turn to Baltimore we will meet with similar facts—the benches heated by the Dieterich furnaces run at a higher heat, but the coefficient of the value of the coal increased.

The question now arises, "How are we to explain these results?" Obviously we must look to the different modes of firing, etc. In the use of the common furnace, let the retort house management be of the most intelligent

character, it is well nigh impossible to prevent firing up or clinkering when a large amount of gas is being evolved. The effect of so doing is plain. The cold air entering through the open door, or the cold coke charged into the furnace, robs the bench of heat that should go to the retorts, and so the coal is distilled, for the time being, into tarry vapor rather than gas. Then, during the latter half of the charge, the heat of the furnace is becoming more and more intense while there is less demand for the heat. Most assuredly these evils are aggravated if the utmost care is not exercised in choosing the proper time for caring for the fire, so that the lowering of the heat caused by a fresh charge of coke, or by an inrush of cold air, occurs at a time when it will do the least harm.

With a furnace like the Dieterich all this is changed. Here the hot coke is drawn direct from the retort into the furnace, and thus is in a condition to give out heat instantly, so that at the very beginning of the charge, when the demand upon the furnace heat is the greatest, there is the wherewithal to draw upon. Who has not noticed when a retort lid is being put on, the tarry vapor issuing from the retort along with the flame? And after the lid is adjusted, though we cannot see what is going on within the retort, is it too much of a demand on our imagination to picture the same vapor going up the ascension pipe along with the gas? Vapor, not gas, because there is not heat enough to convert it into the latter. True, a part of this belongs, by right, in the tar well, but not all; a portion ought to, and would, take the form of gas if the heat were sufficient. Then again as the furnace heat is at its maximum when there is the greatest call for the heat, so it is at its minimum when there is the least demand for it.

Here, then, we would seem to have an explanation of the fact that high heats do not necessarily mean poor gas. The secret consists in adjusting the heat to the gas being evolved, not perforce to an absolute nicety, for the tiling of the setting must act somewhat as a fly-wheel does to an engine; but, approximately, so that at one time there is not such a lack of heat that a quantity of tarry vapor remains in that state, instead of being gasified, and then later, such a surplus of heat that what gas is being made is not being broken up into its less valuable homologues.

If we have contrasted the common furnace with the Dieterich in our statements, it is not because we regard it as the ideal furnace, nor are we ignorant of the excellent results that have been obtained by some managers with the common style of heating; but we have made the contrast as it is, because the facts and figures obtained by the use of the Dieterich furnace are the results of actual practical working; and the deductions drawn from such data must have more weight than mere generalities.

We hope soon to be able to give some facts concerning the operation of the McElhenny recuperator, which continues to give great satisfaction to those who are in charge of its development.

But be the form of furnace what it may, be it the common style, or one similar thereto, but of double depth, or of the generator or regenerator type, we can increase both the yield and candle power, if the heat given out by the coke is approximately in proportion to the gas being made.

THE RECENT MEETING OF THE GAS INSTITUTE.

There were several reasons why the meeting of the Gas Institute, which has but recently become a thing of the past, was looked forward to with more than ordinary pleasure. It was the first meeting of the body in its new form—thus it was felt that a certain degree of novelty would attach to the proceedings; then it was anticipated that the report of the council on the subject of condensation, which they had under consideration during the year, would be a peculiarly instructive and interesting document. Yet, again, the meeting was to be the occasion of the first bestowal of the Birmingham medal. All these facts would naturally lead to the meeting being looked forward to with more than ordinarily agreeable anticipations; and now that we have the proceedings of the conclave before us we must feel that these pleasant anticipations were fully realized.

The inangural address of the President, George Wilson Stevenson, Esq., was a particularly happy greeting to the members; in it the speaker rather avoided going into the details of any given branch of the gas business, nor did he attempt to touch even lightly on all the leading topics of the day as looked at from a gas manager's point of view; but contented himself with considering, in an agreeable manner, a few points in connection with the industry in pursuit of which his listeners were engaged. The desirability of improvements in the process of carbonization received its full share of attention at the speaker's hands.

Doubtless the speaker was correct when he said the increased sale of gas for illumination should occupy the first place in the gas manager's mind. The supplying of light has been the mainstay of our business in times past, and the field should not be deserted until it is shown that its occupancy is hazardous, and that time, in our opinion, is still far distant. The transition o the practice of economy in the construction of works was a natural one, because it is a factor of great potency in the matter of cheap gas. Altogether the address was both instructive and entertaining. Commencing with the recent meeting, the duty of enlightening the members of the Institute in regard to the progress of its affairs during the year, falls upon the council, instead of, as heretofore, the President. In the present instance that body have incorporated in their report the results of their investigation into the subject of condensation.

In regard to this last there is probably room for a little disappointment that the researches have not resulted in any conclusive information on this very vexed question; perhaps, however, when the time for the annual conclave has again come around, the council will be prepared to speak, as with authority, on this matter. None, we think, will question the wisdom of the council in the selection of the first recipient of the Birmingham medal. Mr. Livesey combines the practical worker with the original thinker in so eminent a degree that he has long been looked upon as the leader of the gas profession.

Ample food for thought is afforded by Mr. Travers' paper on "Industrial Copartnership a means for the Reduction of the Laboring Force in Gas Works." True, self-interest is a potent power, but how it can be brought to bear on the conduct of the laboring force of a gas works is not yet by any means clear. Give the employees of a company a certain percentage of the net profits of the concern, and they will shortly look at it not as a bonus—as something given them as a gratuity, but as part of their wages, a perquisite that they have a legal right to. Immediately many embarrassments ensue. The men will feel as if they ought to have a voice in the general management. Complaints will arise from the men if it is thought that one of their fellows is not doing his best to produce good results. Then, again, in large works there are many men employed only for part of the year, and it would be difficult to proportion their share of the bonus. If anyone can devise a means whereby self interest can be brought to bear upon the employees of a gas company in the conduct of its affairs, a great stride forward will be made toward the day of cheap gas; but the problem is a difficult one.

Mr. George Livesey has such a world wide reputation as an independen thinker, that a paper by him is always looked forward to as a great treat; for it may be confidently expected that it will contain either something in itself novel, or else old things put into new form. In the present instance such expectations are more than realized by a perusal of his paper on "The Principles of Gas Holder Construction." Doubtless gasholder construction affects the selling price of gas more than at first sight appears, for the interest on the money invested in the plant of a gas works is a large factor in determining the price to charge for gas, and the cost of the holders is a very large part of the expense of the plant.

Mr. Livesey places the cost of gasholders at one-third of the total cost of the manufacturing plant. The importance of good management in the designing and construction of such apparatus is thus brought clearly home. Manifestly the larger the holder the less will be the cost per thousand feet of its capacity; this has been vividly exemplified in Mr. Livesey's latest work, but it is equally clear that here, as in other things, there is a happy medium. Obviously, for a given send-out, the smaller the number of holders a works possesses the more serious becomes an accident to any one of them.

One point of interest was noted in the discussion of the paper, namely, that as a structure is not stronger than its weakest point, the joining of the several parts of a holder, or its framings, is of paramount importance.

Mr. Eastwood's paper treated of two subjects, so that it might be called two papers in one. In the first instance he described an arrangement of his for relieving the retorts of the pressure of the hydraulic seal. In a word, the plan is to connect the ascension pipe and the hydraulic main by a two inch pipe on which is placed an ordinary two inch stop-cock; the latter has a lever attachment, so that the cock can be opened or shut from the retort-house floor. A similar arrangement we believe has been in use in several works in this country for a number of years. For through retorts Mr. Eastwood provides only one anti-dip, forcing all the gas to pass up one pipe and through the two inch cock. One hour before the end of the charge, the anti dip is closed, thus forcing the gas to pass through the tar in the main, under the presumption that the gas being poor will take up some of the light hydrocarbons from the tar, the hydraulic main being heated by means of steam. In the second part of his paper Mr. Eastwood describes a very compact arrangement for eliminating the tar from the gas. Although the matter of generator furnaces has been pretty thoroughly discussed of late, we are pleased to see that it formed the subject of a paper at the meeting, because we feel that it is of so much importance that time can well be afforded in which to allow members to report the progress that they have made in this department of their work. That the new style of furnace is a move in the right direction few will gainsay; the point to be elucidated is, which one of the various furnaces is, all things considered, best suited to our wants, and we know of no better source from which to gain the desired information than from those who have had experience in this line, and come forward, as Mr. Valon did, to tell what they have and what they have not accomplished. That difficulty will be experienced at starting a new style of furnace, in reg-

ulating the air openings, must be expected; as regards this point we have an advantage over our English friends, because they mostly have large chimney stacks which give draught to several benches, and thus as there is an ever-varying draught in the stack, the trouble of regulating the air supply is greater than when, as is the general custom here, each setting has its separate stack.

Mr. Valon's figures in regard to coke used are possibly open to criticism. To determine the coke used in the furnaces he deducts that sold from the quantity made. Obviously an inaccuracy in estimating the amount made, or in the measure used in selling the coke would affect the result as to the quantity used. Certainly a consumption of 14.78 per cent. of the coke made is a very low figure.

Mr. Hunt's dissertation on "Coal Gas as a Heating Agent" was an able effort. There is certainly no room for raising an objection to the paper on the score of brevity, either in the conception of the meaning of the title chosen, or in the treatment of the various divisions of the subject. The fact that a foot of coal gas is worth two feet or more of water gas is a matter of so great importance that the author did great service in bringing it to the attention of his hearers. There is certainly good ground for holding the opinion that even if in the future there are to be two separate gas services, still coal gas is the more economical for the dual purpose until the demand for gas for fuel and other purposes is so far increased as to ensure the payment of the extra cost of distribution, and the earning of interest on the cost of the plant. We fully agree with the author who, when speaking of gas cooking stoves, says the system of regeneration may be legitimately introduced here. If a given amount of work can be performed with a smaller quantity of gas, it will obviously be equivalent to a reduction in the price of the fuel. Certainly if "condensing" stoves are to be used for heating purposes, Mr. Hunt's suggestion will have to be acted on, and the flues arranged to drain the products of combustion down to the ground in place of the present mode of expelling them above the housetops.

We have not space enough at our disposal to more than mention the paper of Mr. Marsland on "The Practical Working of Tower Scrubbers," and that of Mr. Sugg on the "Application of Gas to the Lighting of Open Spaces," only pausing to remark that the latter subject was admirably handled by the author.

That we have as much to learn in regard to the testing of the electric light by the photometer, as we have relative to its cost, few we think will venture to dispute. Certainly, the term candle power, when applied to the new illuminant, is simply meaningless. It is equally clear that as the electric light is noted for its lack of diffusive power, it is absurd to claim that it is superior to gas for lighting large spaces, but is inferior to gas when used for the illumination of moderate-sized areas. Mr. Sugg did good work in putting this matter so clearly before his hearers.

More than ordinary interest attaches to Mr. Methven's paper in relation to experiments made by him on carburetted gases—the tables recording the results of his work will have a lasting value. Two papers were devoted to the manufacture of sulphate of ammonia.

Finally, this part of the business of the meeting was brought to a close by Mr. Chew, who spoke on electricity and petroleum as competitors of coal gas. The remarks made by the author must carry some weight with them, as he has had experience with the three modes of lighting. We cannot, however, admit that the figures are conclusive, since it is impossible to speak with any degree of certainty regarding the capital an electric light concern would require if engaged commercially in supplying light.

Taking it all in all the meeting was a very interesting one, and we doubt not that the Institute is entering on another prosperous year during which Mr. R. O. Patterson will preside over its affairs.

Electric Light Accident at Rochester, N. Y.

On the evening of the 30th of June, shortly after the electric lights were ignited, it was discovered that the roof of the building, No. 124 State street, Rochester, N. Y., was on fire. An extinguisher was immediately brought to bear on the flames, and the blaze was speedily suppressed. It was evident that the fire was caused by imperfect insulation of one of the wires of the Brush Electric Lighting Company, and, strange to say, no attempt was made to prevent a recurrence of the trouble. The consequence was that about an hour and a-half afterwards precisely the same thing happened. A policeman was summoned, and in his attempts to extinguish the flames incautiously touched the wire and received a severe shock, as did also a man named Clark, who was endeavoring to assist him.

A reporter of the *Democrat and Chronicle* went to the scene of trouble with one of the employees of the Brush Company, and investigation showed that one of the electric light wires had rubbed against the edge of the roof, causing the insulating material to wear away, and the bare wire coming in contact in some manner with a telephone wire fired the woodwork of the projecting cornice. Measures were at once taken to make the conducting wire secure.

Ventilation by Gas.

M. Arthur Morin, Director of the Conservatoire des Arts et Metiers, Paris France, has carefully studied, with instructive results, the problem of ventilation by the aid of gas burners. For kitchens already built and provided with stoves of the usual pattern, ventilation may best be effected by lighting a gas burner at the bottom of a sheet iron air shaft. An example is given of a kitchen measuring 10 feet by 13 feet by 11 feet 6 inches high, having a content of 1,490 cubic feet.

It is proved by direct experiment that a common gas burner, consuming only 1¼ cubic feet per hour, will create a draught in a sheet iron shaft 9½ inches in diameter and 26 feet high, sufficient to carry off 1,257 cubic feet of air every hour. A greater draught will, of course, be insured by a taller shaft; the delivery of a similar pipe to the preceding, but 52 feet high, being at the rate of 1,780 cubic feet per hour. Thus it is manifest that, with the aid of the ordinary kitchen fire, the air of a kitchen may in this manner be changed more than once an hour, and a constant movement of air toward the ventilating apparatus will be set up, which will effectually prevent all smell escaping by the doors to other parts of the house.

The gas burner need only be kept in action while cooking is going on, or, say, during six hours every day. The consumption of gas would therefore be only 8¼ cubic feet daily, or 3,100 cubic feet per year; costing a mere trifle in comparison with the good it would have effected in preventing the dissemination of kitchen odors.

It is observed that the preceding calculation relates to sheet iron air shafts taken through the wall, and carried up to the roof in the open air. If the shafts were made of earthenware pipes, or built into a wall, whereby radiation would be prevented, the delivery of air through it would be much increased.—*Sci. Am.*

Safety Lamps.

The *Iron Age* says it is a well-known fact that when a light is covered by wire gauze, as in a safety lamp, a large proportion of its lighting power is lost, and tests which have been made, the standard being a sperm candle consuming 120 grains per hour, have given the following results—

Davy, naked	.398
" covered	.146=63 p.c. loss
Stephenson, naked	.366
" covered	.131=64 p.c. loss
Clanny, naked	.378
" covered	.296=21 p.c. loss
Mueseler, naked	.368
" covered	.385=4 p.c. gain

The contradictory result obtained in the last case is explained by the more perfect ventilation of the lamp considered, the flame moreover, not being cooled as in other lamps. Safety lamps may remain in a stationary or slowly moving atmosphere of explosive gas for a considerable time without danger, the latter increasing, however, with an increase of speed—thus, a Davy lamp explodes when submitted to a speed of six feet per second; Clanny, eight feet; Stephenson, 10 feet; Mueseler, 15 to 20 feet, according to the dimensions of the outlet of the chimney and the position of the lamp.

Quality of Cements.

The following statements concerning cements may prove of value: It has been very generally conceded that cement prepared by grinding with millstones has only half the firmness that it shows when ground in centrifugal machines. The difference is explained by the fact that the centrifugal mode of grinding yields a much more finely-divided product, which increases the hardening quality of cement mixed with sand. Coarse sand gives the highest degree of solidity and firmness to cement. It is unnecessary, when coarse sand of one sized grain has been used with cement to mix finer sand with it to fill up the interstices of the mixture, as other indifferent substances can be used with equally good results. Moist carbonic acid has been found to diminish the firmness of cement to a considerable degree, and in a short space of time. The great difficulty encountered in manufacturing marble imitations from cement is to prevent the cracking of the latter. Cement cracks when it is made up with too much water. It then forms a vitreous crust, and is not homogeneous throughout its mass. By adding finely crushed granite fragments to cement without sand, a material is obtained that has great hardness, and which is susceptible of taking a high polish.

Russia's Coal Production.—In 1881 the total production of coal in the basin of the Don amounted to 21,600,000 tons, a decrease of three millions of tons from the product of 1880. The diminished output is to be attributed to lack of transportation facilities, and to scarcity of labor at certain seasons of the year when the Russian laborer prefers to work in the harvest fields.

[From the London "Journal of Gas Lighting"]

The Gas Institute.

INAUGURAL ADDRESS OF PRESIDENT GEORGE WILSON STEVENSON, ESQ.,
Delivered Tuesday, June 13, 1882, at the Institute of Civil Engineers,
25 Great George Street, Westminster.

GENTLEMEN—My first duty on taking this chair is to thank you for having conferred upon me the honor of electing me to preside over your deliberations; and this I do very sincerely.

When considering what I should say to you on this occasion, I could not help wondering why you had placed me in this position. Presidents are elected from various motives. For instance, a President of the United States is now-a-days usually elected, not because he is a particularly prominent man, and certainly not because he is identified very strongly with any of the great political parties in the country. He is usually a man who has not, up to the time of his election, made his mark or impressed his individuality on public affairs. In fact, the Americans seem to elect their President on the principle that he should be a decent sort of quiet man, who will keep things together and not get the country into trouble. A member of Parliament, moving the appointment of a Committee of Inquiry into any matter, presides over that committee as a thing of course. Scientific and learned societies adopt other methods. They usually select their most prominent men to preside over them; and I think they are right, because, according to my notion, if the presidency be a mark of honor to the individual, it is still more an occasion and an opportunity for service by the individual to the body. I cannot claim, as most of my predecessors justly can, to be a prominent member of the Gas Institute; but I can honestly say I have desired, and do desire to be useful to it; and this I conceive is my only justification for being here to-day.

Gentlemen, this is the first general meeting of the members of the Gas Institute. We are an old body with a new name. It will be difficult, if not impossible, to improve upon the brilliant success of the annual meeting in Birmingham last year. The British Association of Gas Managers expired amid a halo of glory which will be long remembered; but we must not despair of the future, but believe that, under its new title, the same body—the Gas Institute—will go on adding fresh interest to its meetings, greater stores to its knowledge, additional members to its community, and more value to the enormous commercial industry which it represents.

We live in ticklish times. Change seems to be the order of all things. The "rest and be thankful" period has gone by, and all is moving onward. With the people who desire change for the mere love of novelty, I think we need not trouble ourselves; they will find their goal sooner perhaps than they wish. But with regard to those who seek in change something better than they have at present, I venture to think we have much to do; and we shall be sadly blameable if we do not exert upon them such an influence as will educate them in the right direction, and mould and fashion their conclusions and practices.

The cry is for "light, more light." Gentlemen, this is a cry which we ought to rejoice to hear. It is our special duty to encourage it, and our especial business to satisfy it. We make and sell light, and we desire to make and sell it more abundantly. We honestly believe that we have the best artificial light for general purposes, and we should be false to ourselves if, holding this belief, we did not seek to educate others in the same belief, and take infinite pains to demonstrate to them the advantages of our light over that of tallow, oil, petroleum, or electricity.

Competition by light-producers for the custom of the public never was so brisk and keen as at the present time; and this competition is likely to become more severe rather than otherwise. Candles have been for years made with self-consuming wicks and odorless light-giving material; so that it is now difficult to understand how they can be further improved. Lamps for consuming vegetable and mineral oils have been also wonderfully improved of late years, and every succeeding year shows that still further improvements are possible. The electric light has come upon us, not as a novelty, but as a somewhat more practical competitor than formerly for the favor of the public; and its promoters have, during the last year or two, made great efforts toward meeting the domestic requirements of the public by the introduction of incandescent lamps, as they are termed. Candles and oil lamps have long had to yield the precedence to coal gas, both for efficiency and cheapness. The electric light will be—indeed, must be—further improved and cheapened; and it is just in the proportion that its promoters are successful in improving and cheapening it that it will become formidable as a competitor with gas for the lighting of our streets and dwellings. At present we have really nothing to fear from it; but its very presence among us ought to be sufficient to stir us up to maintain the supremacy we hold, and the practical monopoly we enjoy, of supplying artificial light throughout the United Kingdom.

I will suggest to you some points in which and some methods by which the supply of coal gas may be so cheapened and used as to accomplish this most desired end.

Obviously, the first point to which you will expect me to direct attention is the improved carbonization of coal. Within less than twenty years, 8,000 feet of gas sold from a ton of coal was considered excellent working, and was frequently so quoted by the late Mr. Barlow in evidence before Parliamentary committees of both Houses. By improved methods of setting retorts, by more careful and intelligent firing, by the use of higher heats, by enlarged connecting pipes, and especially by systematic reduction of the unaccounted-for gas in distribution, it is now possible to sell from 9,000 to 10,000 feet per ton of coal carbonized; and there are exceptional instances in which more than 10,000 feet are sold on the year's working. Notwithstanding all this, however, it is a fact that while we have amended our processes of condensing, of scrubbing, of purifying, and to some extent of storing gas, we continue to use the same form of retort for the distillation of coal, and to charge and draw the retorts in pretty much the same fashion as was adopted by the originators of the gas industry at the beginning of this century. It is true that the heat-absorbing iron retorts have given place to retorts made of fire-clay; that retorts have been somewhat relieved from pressure by the use of exhausters, and in some instances by the removal of the hydraulic seal; and that the operations of charging and drawing have been rendered more easy by the use of machinery in place of manual labor. But nothing has been practically accomplished in the way of distilling coal by passing it continuously through a retort with a constantly closed entrance, and thereby getting a larger yield of gas per ton of coal, and a uniform make of gas per hour both as regards quantity and quality. Experiments have been made, and are being made, with a view to bring to perfection an improved method of carbonization on this principle; and I commend the investigation to all such members of the Institute as have time and opportunity to conduct experiments for themselves. You can readily conceive what a different place the retort house would be if the drawing and charging of retorts were abolished, and how much more humane the process of carbonization would be if the coal were passed continuously through retorts by machinery, instead of being shoveled into and drawn from them (while at a white heat), by men in a half-naked condition, drowned in perspiration and covered with coal dust. Because we have been accustomed all our lives, and some of us every day of our lives, to see this sort of thing, it does not make the practice one bit less degrading or reprehensible. And, independent of the social aspect of the labor question in our retort houses, there is the pounds, shillings, and pence consideration. If the opening and closing of retorts were done away with, how much heat would be saved, and how much time for carbonizing would be gained. And what an advantage it would be to send the coal through the retorts in thin layers, so that it shall be very quickly distilled, instead of lying in a mass—part coal, part coke, part tar—for six hours at a time, until the whole has become carbonized. When you come to consider it, the present method of carbonization is primitive in the extreme; and I am satisfied that it needs only that the attention of the members of the Institute should be called to it in order to its being superseded by a newer and better and more profitable method. I do strongly urge this subject upon your attention. It remains for someone to discover and perfect a more excellent way. Will not some of you younger members of the Institute, who have time and energy and skill and perseverance, take this matter in hand, and gain for yourselves renown and the gratitude of all who wish well to their fellow-men? This, or something like it, has to be accomplished before the first step toward greatly cheapening gas will have been effected. To make gas much cheaper, we must get more of it from the coal, and at a less cost for labor.

Improved carbonization has a directly cheapening effect upon gas, by reason of the fact that the greater productive power of the retorts enables a larger yield to be obtained from a given number of retorts, and within a given space. There is thus a saving of capital outlay, and to that extent a reduction in the required dividend, which forms part of the selling price of gas; and it only needs a slight acquaintance with the circumstances of gas companies throughout the Kingdom to see what easy running those companies make who require only 6d. to 1s. per 1,000 feet with which to pay their dividends, as compared with the laboring effects of other companies heavily handicapped by a dividend of 2s. to 3s. per 1,000 feet. But this is rather anticipating a point to which I shall have to refer more particularly by and by.

Increase of business is another very important element in the cheapening of gas. There is a disinclination on the part of some managers, who have had an engineering education, to regard their work from a trade point of view; and they complain that the managership of a gas undertaking is degenerating more and more into a business avocation. I can sympathize with this feeling, but I cannot encourage it. Besides doing his work well as engineer, I am of opinion that a gas engineer should lay himself out in every way to promote and extend the business of his employers. When there are no extensions and alterations going on in works sufficiently large to warrant the employment of good foremen, a manager can scarcely find full employ-

ment for his time unless he has some project in hand outside the routine duty of his work; and we all know what a reverend doctor of a past generation wrote about "idle hands;"—not that I impute to any professional brother that he would get into "mischief" of any sort, but I do say it is well for each and all of us to be fully employed, and rather to be overworked than underworked. Now there is grand scope for a thoughtful and diligent manager in devising plans for extending the business of a company or local authority, and for carrying those plans into execution.

The increased sale of gas for *illumination* must, I think, always occupy the first place in a manager's thoughts and energies; but there is the large and, in many towns, nearly unoccupied field of *day consumption* to be entered upon. Local exhibitions in connection with even our smallest works, displaying the best cooking and warming stoves, etc., and the best burners for illumination, would excite the curiosity and instruct the minds of the general public and lead many to use gas for domestic and industrial purposes who are now ignorant that it can be so used, and that it affords an economical substitute for coal or coke. The best appliances should be always kept on view at the offices of each company, and someone should be there ready to explain and show the uses of them. The circulation of printed matter in a cheap form, simply expressed, giving a few prominent facts comparing the cost of gas with the cost of coal for cooking and heating, may be productive of much good in increasing the business of a gas company. The distribution should be from house to house. Mr. Fletcher, of Warrington, has printed a lecture delivered by him before the Manchester Scientific Students' Society, which is admirably suited for perusal by those who wish to know of a "clean way of doing dirty work." It is entitled "Our Self-Acting Domestic Help;" and I am glad to see it has reached its fiftieth thousand. This lecture explains in a most felicitous style how the cooking and warming in Mr. Fletcher's own house have been done for many years past, and what a labor-saving agent gas is in domestic arrangements. This lecture is too long for the purpose of house-to-house distribution; but every manager should have a number of copies in his possession to give to those who would appreciate such information.

While perhaps the majority of consumers may be willing to pay a reasonable rent for cooking stoves and other gas-using appliances, and while others may be willing to purchase them outright, I am of opinion that the proprietors of gas undertakings would find it remunerative to lend stoves, without rental in the first instance, to those who object to pay for them. At any rate, this plan should have a trial; for be it always remembered the first cost of a moderate-sized gas cooker is ridiculously small, and the outlay once made does not need to be repeated, while the consumption of gas goes on daily, and sensibly augments the quarterly gas bills. The comfort, convenience, and cleanliness of gas cooking are so considerable that I feel sure if stoves were lent without hire for a year or two most consumers would have learnt so to appreciate them that they would prefer in future to pay the rent demanded rather than allow them to be removed.

I do not see much prospect of reducing the cost of gas in the processes of condensing, scrubbing, and purifying; but it is possible, in connection with most of our gas undertakings, to considerably reduce the quantity of unaccounted-for gas. There are some notable examples of extreme economy in distribution; but I am sorry to say they are the exception and not the rule.

A much more diligent supervision of mains, services, and meters than is generally given would amply repay managers in enhanced efficiency and economy; and when we consider that this is the most patent and the readiest item of management which admits of revision in the direction of economy, it is marvelous that it is not more attended to.

Economy in the construction of works is the last point I mention as contributing to the cheapening of gas. In his early career, an engineer, as a rule, seeks to obtain professional credit by designing and carrying out works at as little cost as is consistent with efficiency. Unfortunately, as he becomes established, he is too apt to regard only efficiency, and almost to ignore economy. There are some lamentable instances in this country of companies burdened with capital expenditure out of all proportion to the business they do or are ever likely to do. I do not now refer to cases in which public convenience has compelled the abandonment of existing works, and the erection of new works on sites removed from urban populations; nor to cases in which the works date from an early period of gas lighting, when, of necessity, much that was done was mere experiment, and had to be removed and replaced by sounder methods at a double cost; nor to cases in which the undertakings have been transferred by purchase, at their commercial value, from one body of proprietors to another; but I refer to cases of extravagant construction, and to cases where the works have been built without design, the consequence being that when some new plant or apparatus had to be provided some existing plant had to be displaced to make room for it. Many works, to my knowledge, have been constructed over and over again from no other cause than this—namely, that there was no general plan to begin with. I suppose the Wavertree Station of the Liverpool Gas Works, constructed in 1855–7 by the father of our respected member, Mr. William King, was perhaps the first gas works built on a regularly designed plan; but, with such a model as an example, it is a marvel to me that our engineers and managers could go on as they have done since then, and as many are doing to-day—sticking a retort house down here, purifying plant there, gasholders between the two, and the other parts of the apparatus in any spot where a bit of spare land happened to be available.

Now the first essential in arranging the different parts of a gas works is that the engineer should have before him a correct plan of the site. If the levels are various, they too should be marked upon the plan, in figures or by contours, so as to assist the judgment of the engineer in the disposal of the plant; for obviously he will not place a retort house or coal store on the lowest part of the site if it be liable to flooding, nor would he (other things being equal) choose the highest part of the works for his gasholders. Having a correct plan of the site and the levels before him, the engineer will proceed to fill up the whole plan (leaving proper yard space for coke); taking care not to have any backward or forward work with his connecting pipes, but to have all the processes straightforward, one following the other. If the site be larger than is required for the present or immediately prospective wants of the district, he will perhaps design the works in duplicate, making every part of it in duplicate; or he will provide for extensions of each part of the works, and show, by differing colors, those parts which are to be constructed immediately, and those which are to be constructed at a future time when required.

In works of any considerable magnitude there is great convenience in designing it in duplicate or in sections, because one part may be set aside completely for repairs in the summer, and this being done with alternate sections in successive years, excellent opportunities are afforded for completely overhauling and thoroughly restoring the plant. In smaller works this is impossible. All I desire to impress upon you is the absolute necessity of seeing the end from the beginning in the arrangement of your works; so that when the site has become fully occupied it may present an orderly and well designed appearance, and the works admit of easy management. By the by, I wonder how many members of the Institute have accurate plans of their works, showing all the connecting pipes and valves and drip boxes. To those of you who have them I need say nothing of the comfort and sense of security you derive from their possession; and to those who have them not (and I fear very many of the members are in this category), I would say, Let this be the first work you do when you get home; for then on the wet and windy nights of the coming winter, if anything goes wrong underground, you will be able to "spot" the source of the evil immediately, and rectify it without delay.

The proceedings of the Institute during the past year have been embodied in the report from the Council to this assembly, a copy of which has been sent to every member of the Institute.* Until last year these matters formed an important paragraph in the President's address; but since then, and hereafter, they have been and will be dealt with by the Council as part of their duty.

The functions of the Institute are frequently referred to by writers in the professional journals and by speakers at various meetings of district associations and elsewhere. One writer in the *Journal of Gas Lighting*—"Owen Merriman"—whose contributions are always both interesting and instructive, has happily defined the Institute as "the representative body of the gas industry;" which industry, he says, "is at once the cause of its existence and the object whose success it is designed to promote." The President elect, in his address to the Midland Association of Gas Managers in April last said, "It is impossible to estimate at its true value the benefit gas proprietors and the public generally have derived from the formation of gas institutions and associations." I fully endorse the propriety of the definition of the Institute and its objects, and also the statement as to the results already obtained from the existence of the Institute and kindred associations. But very much more remains to be done. The gas industry is only as yet beginning to feel the benefits arising from the establishment of the Institute. Nothing can be done without money. You may have intelligence and enthusiasm and perseverance, but without money you cannot investigate doubtful subjects, nor make your experience known to the world. The Institute has always been fettered in its operations for want of money, and necessarily so because until just now the industry which is the cause and object of its existence, although it has received great benefits and advantages from it, has done literally nothing for it. The Council have lately put this matter before the boards and committees of management throughout the country, and have invited their co-operation in increasing the funds of the Institute, and thereby extending its usefulness. I trust the result will show that it needed only the appeal should be made in order to its being liberally responded to. All honor to the members of the British Association of Gas Managers and of the Gas Institute who have for so many years, by their

* See p. 35.

own self-denying efforts and their own cost, maintained an organization which has effected so much in the way of mutual improvement, and so much for the interests of the great industry with which they are identified.

Technical research, with a view to the pronouncement and authorization of the best methods in each of the processes of gas manufacture, and to the discovery of new and improved methods, is undoubtedly one of the chief functions of the Institute; and, now that there is a prospect of funds being available for the purpose, such research may be diligently prosecuted. But I confess that I could never see the propriety of research being undertaken by members of the Institute at their own cost, when the gas industry throughout the world would reap the benefit.

I have often heard it said that in the papers which are read before the Institute, and in the discussions following thereon, what is wanted is not theory but practice. If the word opinion be substituted for theory, I quite agree; but correct theory and good practice go together. An algebraic formula in physical science is theory, and is considered very foolish by a man who does not understand it; and yet the formula is deduced from, and is the direct result of practical experience. Pure mathematics are the most absolute theory, and yet they are the groundwork of education in the highest schools of the Kingdom, and proficiency in mathematics secures the most distinguished collegiate honors. Let us not despise theory, but test its accuracy by practice.

You have all noticed, I doubt not, with what persistency the daily press of this country, until quite lately, has endeavored to depreciate gas and gas property, and to exalt the merits of the electric light. To my mind the conduct of the press, and especially the daily press of London, has been simply scandalous in this respect. The following abbreviated extract from an editorial—headed "The Profits of Gas Making"—in the *Globe* newspaper of July 30, 1880, is a fair sample of the ignorance and audacity which the London daily papers have exhibited in respect to this matter:

"The Leeds Gas Company has been reducing the price of gas from 2s. 2d. per 1,000 feet to 1s. 10d., and a well-known gas chemist has been making known a few facts which enable us to perceive how such reduction may very well be done. His exposure of the secrets of gas making will no doubt modify a good many opinions that have been formed in the outside world as to the profits of the business. He has made a series of analyses of various kinds of coal, and has tabulated their products. Different coals show a remarkable disparity in many respects, and only experts could say precisely what may be the net profit from a ton of coal; but some idea may be formed by a glance over these figures. About 3s. 6d. per 1,000 cubic feet may, we suppose, be taken to be the London price for 16-candle gas. A ton of Clay Cross cannel coal yields over 7,000 feet of gas of 21.5 candles, besides coke, tar, tar water, and so on. Now Clay Cross cannel gives 10,298 feet of 18-candle gas per ton, and the coke remaining weighs nearly as much as the coal before it passed through the retorts. One description—the Howley Park cannel "tops"—yields 11,952 cubic feet of gas having an illuminating power of 20.5 candles, and besides this leaves nearly 19 cwt. of coke and 18 gallons of tar."

You will see that the writer is endeavoring to show that the gas obtained from coal costs nothing, being paid for by the residual products, and that therefore the whole receipts from the sale of gas are profit. He ignores, or forgets, the capital expenditure for making and delivering the gas, and the interest a capitalist requires for his money, and also the cost of labor, and the not unimportant item of repairs and renewals. To complete the exposure of this writer's absurdity, I need only add that, according to his figures, one ton of this Howley Park cannel "tops" would equal, after distillation, a weight of 1 ton 4 cwt. 2 qrs. and 25 lbs. in gas, coke, and tar.

A further sentence in the same article states that "many coals leave in the retorts coke which will realize at least as much as the companies pay for the coal; gas and all other products being profit." The object of this article was clearly to persuade the readers of the *Globe* that gas companies could afford to give away gas; one reason being because they got 24½ cwt. of product from a ton of coal! And this is a specimen of the stuff that London daily papers serve up to their readers when trying to depreciate gas companies and exalt the electric light.

Since our last annual meeting there has been nothing in private bill legislation to attract special attention, except that a hybrid committee of the House of Commons this session unanimously passed the bill of a local authority within the gas limits of another local authority to enable the smaller body to acquire compulsorily the distributing apparatus and goodwill of supply within its own limits. This decision was arrived at notwithstanding the very determined opposition of the larger body now supplying. The opposition is to be continued, it is said, in the House of Lords, and, if fruitless there, Parliament in both Houses will have decidedly affirmed the propriety of each local authority having the control and management of its own supply in cases where one local authority supplies a number of other outlying local authorities.

My opinion has always been that if it be good for one local authority, having an extensive district, to enjoy the profits arising from the manufacture and supply of gas, it is also good for a smaller local authority, provided only that the smaller body is not too small to undertake its own supply with equal advantage; and even then it seems reasonable that the smaller body should be authorized to take its gas in bulk (on arbitration terms), and distribute it within its own limits, and apply the profits resulting to the benefit of its own district. Nothing can be much more aggravating to a local authority than to see another local authority invading its district with a trading monopoly, and applying the profits to the reduction of the rates in the adjoining district.

Just a word here about the profits realized by local authorities from the sale of gas. You are probably all aware that the limitation of profit put upon companies by the legislature is entirely removed from local authorities, who are at liberty to make any amount of profit they can within the maximum price inserted in each act. It has been frequently urged by gentlemen connected with municipal institutions that it is impossible for local authorities to charge unreasonable prices, and to make unreasonably large profits from the sale of gas, because public opinion would operate to prevent it. But is this so? There is generally a differential rate of price to consumers within and without a borough or district; and so long as the difference only expresses the increased cost of supply outside, there is nothing to be said against it. But the difference is often greatly more than is necessary to produce equality, and is used oppressively in order to increase the revenues of the central authority at the expense of the consumers in the outlying districts. Public opinion within the central authority's district is directly interested in maintaining a high price for gas in the outside districts, and there is practically nothing to regulate the price; the rule being to put it as high as the outside consumer can be made to bear it. Even within the central authority's own district the idea of a regulation of price by means of public opinion is not tenable, as is shown by the enormous profits local authorities generally make from the sale of gas.

My opinion is that the time is coming when Parliament will be compelled to intervene to regulate the profit which local authorities may make—whether by fixing a certain sum in regard to each thousand feet sold, or by a percentage on capital I cannot say. If the latter, the percentage must be upon a hypothetical capital, because a local authority just entering on its business by purchase, at the commercial value of the undertaking, from a company of proprietors, has an exaggerated capital; and again, when the sinking fund has been in operation some time, the invested capital remaining does not represent the structural value of the concern. I think that a local authority should be entitled to make profits equal to those which a company would have been entitled to if it had continued in possession, but to nothing more; and some means ought to be devised to prevent local authorities victimizing gas consumers for the benefit of the general ratepayers.

The Select Committee of the House of Commons appointed to consider the many bills promoted this session by companies and local authorities for the establishment of electric lighting have decided that the Board of Trade, with the consent of the local authority, shall be empowered to grant licenses for the supply of electricity within defined areas. Where the local authority objects, the Board of Trade may still grant a provisional order; but such order will require the confirmation of Parliament. If this decision of the Commons Committee becomes law, then in cases where the Board of Trade and the local authority are agreed, the Board is to have the power to grant a license, which will carry with it permission to break up the streets to enable any promoter to supply electricity in competition with gas. I mention this only to show to you how the Board of Trade is gradually seeking to arrogate to itself the powers hitherto somewhat jealously retained by Parliament. It is assumed that the Board of Trade and a local authority combined *must* know what is most for the public welfare; and henceforth, if this proposal be adopted, the *quasi* monopoly of gas companies will be placed on the same footing as the chances of an omnibus proprietor, who is liable at any moment to have his business interfered with by a tramway company. Licenses for electric lighting are to be granted in precisely the same way as licenses are granted to tramway promoters, although the difference between an omnibus proprietor and a statutable gas company is very marked. Municipal government for certain purposes is very well in its way; but when we see to what length the powers of municipalities are to be extended by a gentleman who is at once the apostle of municipal government and the president of the Board of Trade, we may be thankful that we have yet a House of Lords, and that to a committee of that House must be submitted the bill which is to empower electric lighting authorities, and which contemplates and contains provisions for the time when the supply of gas shall be unremunerative, by reason of the general adoption of the electric light.

There is another matter affecting the gas industry which needs the interference of Parliament, and that is the law of rating. The practice now is for assessment committees to put up the rateable value of a gas undertaking to anything they please, regardless of principal and without any data whatever

to go upon; and then the unfortunate company must appeal, and either make the best terms it can or fight at a great cost before a tribunal utterly incompetent to understand even the alphabet of rating. The law, so far as it has been settled in regard to rating, is contrary to common sense; and the whole question, both of law and practice, is so involved in uncertainty that it requires a large amount of courage, and a very long purse, for any one company to contest a rateable value with an assessment committee before a Court of Quarter Sessions. It is only by the united action of companies representing the gas industry, and by their carrying an appeal to the highest court, that the law of rating will be satisfactorily settled, and even then it is probable that the intervention of Parliament may be necessary.

On looking around me I cannot help perceiving, from the frosty or partially denuded appearance of many heads, that a considerable number of us have passed the prime of life. It is a debateable question as to when a man is at his prime. Certain I am, however, that after fifty we get tired sooner and recruit less easily than at an earlier period of our lives; some of our hopefulness dies out, some buoyancy is lost, and we have less faith in ourselves. We are less inclined to exert ourselves than formerly, and we feel that the time is near when we must stand aside and let the young and the courageous take our places. But in this there is nothing to regret. When we have lived fifty years or more we have at least had our chance of success. If we have missed the chance, it has, generally speaking, been our own fault. If we have made the most of our time, we have earned the right to take things easily. Who that has done a good day's work needs or desires to toil all the evening too? Thank God, there are the young and energetic among us. If we elders are to be superseded by our juniors, who push by and outrun us, we cannot avoid it, and we ought not to mourn over it; but, on the contrary, help them, by our greater experience, to avoid mistakes which we have made, and to practice the lessons which we have learnt, perhaps, too late to be of use to ourselves.

Gentlemen, in addressing you I have purposely avoided technicalities, and I have not troubled you with observations on any branch of engineering other than that specially cultivated by the members of this Institute. Let me conclude by expressing the hope that perfect good temper and geniality may prevail in our discussions, and that the meeting of our annual assembly of 1882 may be productive of good fruit, not only in additional friendliness among the members, but in the learning of lessons and in the acquisition of knowledge and of impulses which shall enable us, after we have separated, to do better work in our several spheres of usefulness.

Report of the Council.

June 3, 1882.

The Council report that the total number of members of all classes upon the roll of the Institute on the 1st instant was 725. During the year just ended information has been received of the death of ten members, these being—

Bickford, J. M.	Carshalton.
Blackburn, James	Calcutta.
Fleming, W.	Lancaster.
Harris, E. H.	Wallasey.
Holmes, W. C.	Huddersfield.
Loam, M. H.	Nottingham.
Middleton, J.	Wandsworth.
Ogg, D. W.	London.
Price, R.	Llandudno.
Watson, J.	Herne Bay.

At the moment that this report is going to press, information has been received of the death of Mr. James Blackburn, engineer to the Oriental Gas Company, Calcutta. Mr. Blackburn was one of the founders of the Gas Institute. Being at the time manager of the gas works at Droylsden, he attended the meeting held in Manchester in the 1863, and was then appointed Honorary Secretary of the infant Association, a post he continued to hold till his appointment to Calcutta in 1868, when he retired, and his place was filled by the present Secretary, Mr. Bennett. In recognition of his services to the Institute, as well as his own distinguished merits, Mr. Blackburn was made an honorary member in 1874. His premature death will be sincerely mourned by all who knew him, but especially—because they knew him best—by his old friends and neighbors of Lancashire and Yorkshire. Mr. Blackburn died at Weston-super-Mare on the 23d ult., aged 46.

The Council feel that they cannot properly omit a reference to the death of Mr. Keates, late Chief Gas Examiner to the Metropolitan Board of Works. Many members of the Institute knew him intimately, and respected him highly.

Within the past year four members have withdrawn.

The Council have had under their serious consideration the financial condition of the Institute. Although the income from all sources has hitherto somewhat more than sufficed to cover the expenditure, this result has only been attained by confining the expenditure to matters of bare necessity. There are many ways by which the usefulness of the Institute may be increased, all of them demanding an expenditure for which the funds at the disposal of the Council are inadequate; and it has become evident that a considerably augmented income is desirable. Accordingly a letter, embodying the views of the Council upon the subject, has been issued by the President, inviting companies and corporations owning gas undertakings to become subscribers to the Institute. There has not been time for the receipt of many replies, but the responses to hand have been generally satisfactory.

In fulfillment of the pledge given at the last annual meeting, the members were, in March last, invited by circular to send in any suggestions for the further amendment of the rules. No alteration has been suggested by any one.

A wish having been expressed by many that there should be a meeting of the members of the Institute at the Crystal Palace during the continuance of the International Exhibition of Electrical Appliances, invitations for such meeting, to be held on the 28th of February, were issued by the President. The invitations included directors of gas companies and members of gas committees, it having been thought that an excellent opportunity would be thus afforded for an interchange of opinion upon a subject of common interest and of great importance. The attendance was large, numbering 360, and the arrangements that had been made for conducting the party round the Palace to the various objects of interest were highly appreciated. The meeting concluded with a dinner, followed by a discussion, introduced by the President, in which several prominent members of the Institute took part. The meeting, having been of an informal character, will not be reported in the Transactions of the Institute, but an authorized report appeared in the *Journal of Gas Lighting* for March 7, 1882.

A special meeting of the Council was held on October 25 last, to consider what steps should be taken, in compliance with the resolution adopted at the last annual meeting, for the promotion of investigation and research on technical subjects. It was ultimately decided to undertake a preliminary inquiry with regard to the influence of condensation on the illuminating power of coal gas; and a committee, consisting of the President, Messrs. C. Woodall, C. Hunt, R. Harris, and the Secretary, was formed for the purpose. A series of questions bearing upon the subject was prepared by them and circulated, and eventually the committee presented a report, of which the following is a copy:

"The committee appointed by resolution of the Council dated Oct. 25, 1881, report that 68 replies were received to the list of questions which, with the approval of the Council, were addressed to each member of the Institute. These relate to 81 different works, varying in size from a carbonizing capacity of upward of 160,000 tons of coals per annum to that of less than 500 tons per annum; and they bear evidence of the exercise of considerable care, and a desire on the part of the authors to assist in carrying out the object in view. The work of tabulating and of extracting from the returns the precise information required, being of a special nature, was entrusted by the committee to Mr. F. W. Hartley, who furnished them with a report from which they have derived material assistance.

"The object of the inquiry being to ascertain as far as possible the effect of different methods of condensation upon illuminating power, it was sought by the questions to elicit information generally as to the results obtained in carbonizing; the quantity and quality of the tar, as shown by its specific gravity, at different portions of the apparatus; and the methods and extent of condensation. Question No. 13 was directed chiefly to the possibility of variations in illuminating power as the effect of extremes of atmospheric temperature; but the tolerably equable temperature that prevailed during the period within which the recorded observations were made has materially limited the usefulness of the answers to this question.

"No exact record appears to be anywhere kept of the temperature of distillation, which is variously estimated at from 1,600° to 2,500° F. Probably the nearest approach to accuracy would be to assume a temperature, where fairly good results are recorded, of from 2,000° to 2,200° F., the former figure having been arrived at in one instance by means of a Siemens pyrometer.

"It was greatly to be desired that the classification of the returns should have been determined according to the description of coals or cannel employed, because of the variable yield and quality of the tar produced; but this was found impracticable, in consequence of the great variety of coals used in many instances, and the general absence of information as to the proportions of the different kinds. Incidentally, however, it may be mentioned that the returns indicate a greater yield of tar, not only, as was to be expected, in works where cannel is almost exclusively employed, but also in those in which inland—namely, Derbyshire, South Yorkshire, and Wigan—coal is used, than where the supply is mainly derived from the Durham coalfield.

"With regard to the effect of contact of the gas with tar, and the extent to

which the process of "cooling" or condensation may be carried without injury to the gas, it has been extremely difficult to arrive at any positive conclusion. Sufficient evidence, however, exists in the returns to show that it is beneficial to remove as much as possible of the heavy tar at a comparatively high temperature; and also that it is undesirable to reduce the temperature of the gas at the outlet of the condensers to that of the atmosphere when the latter is at or below say 45° or 50° F. In proof, very good results are recorded in two instances in which separation of the heavy tar is largely effected by the simple expedient of a series of wire gauze or perforated zinc strainers placed within the foul main; as much as 80 per cent. of the entire quantity of tar being removed by this means. In one case the foul main is of ample size to admit of the passage of the gas, notwithstanding the limitation of its area by the introduction of the perforated plates; but Mr. Hartley has made a suggestion, which indeed is obvious—viz., that where the mains are not sufficiently large to permit of a reduction in area, a moderate length of the foul main might be cut out, and a piece of larger area substituted, in which the strainers could be placed. It should be stated that the exclusive use of anti-dips, in one of the instances referred to, appears to contribute to the satisfactory character of the results; while in opposition to the evidence afforded by them, and, indeed, to the balance of experience as recorded in the returns, is that of one member, who furnishes the statement that the results of 69 experiments show a gain of half a candle by keeping the gas and tar together, and drawing off the latter at a temperature of 70° F.

"As to temperature of condensation, some of the returns point to a distinct gain in illuminating power by maintaining the temperature of the gas at the outlet of the condensers above that of the atmosphere in cold weather; but it is not made clear as to whether, or how much of this advantage is subsequently lost during storage and distribution. This much seems evident, that the loss, if any, is more appreciable in the case of cannel gas, or of gas made largely from cannel or bituminous shale, than in that of common gas; and the same observation applies to loss in distribution apart from condensation. It has, however, been impossible to determine this point with accuracy from the returns; and the committee are of opinion that a series of experiments bearing upon this branch of the subject is greatly to be desired.

"It is apparent that the determination of the principles upon which condensation should be conducted must precede that of the form of apparatus to be employed. Varied experience or direct experiments, which should include the comparative value of the resultant tar, can alone decide, with indubitable authority, the point at issue; but, with the materials furnished them by the returns, the committee can arrive at no other conclusion than that the object to be aimed at is the speedy separation of the tar and gas, though to what extent this should be carried—whether throughout the entire process of condensation, by multiplying the points of separation, or confined within the high temperature limits of the hydraulic and foul mains—they are not in a position to decide. The members have it in their power, by individual action, to do very much toward elucidating this point, since there are many forms of condensing apparatus that are susceptible of modification to suit the purpose of comparative experiment, the essential condition of which should be uniformity of working in all details—such as temperature of retorts, duration and weight of charges, description of coal or cannel used, method of purification, etc.; while at the same time the observations of temperature and illuminating power should be made as frequently as possible, and with the greatest care. The committee, however, regard it as highly desirable that experiments upon this and other debateable matter referred to in this report should be conducted under the immediate auspices of the Council, and they recommend that inquiries be made with a view to obtaining the necessary facilities for this purpose.

"In concluding this report, the committee feel that, although the results of this first attempt in a new and important direction have not been entirely conclusive, yet that they are fully justified in deriving from it the confident expectation that a continuance of such labors will result in permanent advantage to the interests of gas manufacture."

The Council have felt gratification in being able to adopt this report; and have reappointed the committee, with instructions to carry out the suggestions therein contained, and continue the investigations as far as practicable. They trust that in this work the committee will have the co-operation of members who may have it in their power to render them special assistance. It is intended to print with the Transactions the returns referred to in this report as tabulated by Mr. Hartley, omitting the names of the works to which they refer.

The Council announce that in pursuance of the trust devolving upon them under the terms of the Birmingham Medal gift, they have made the first award of the medal, unanimously, and after full and careful consideration, to Mr. George T. Livesey. The presentation will be made at the forthcoming annual meeting.

LIQUID GLUE.—Dissolve 8 oz. glue in ½ pint of water and add slowly 2½ oz. strong nitric acid,

Lead Pipes and Lead Contamination.

By WILLIAM THOMPSON.

At the late meeting of the Manchester Literary and Philosophical Society, Prof. Wm. Thompson delivered the following address on these topics. The subject is well and ably handled, and cannot fail to be of interest.

About three years ago I examined a sample of water to ascertain whether it contained any objectionable ingredients, and found it to be contaminated with lead to the extent of 0.197 grains per gallon.

I advised that this water should not be used for drinking purposes, on account of the lead which it contained; and I afterward learned that one of the members of the family, being ill and under medical treatment, suspected that there might be something wrong with the water in question, because she was better in health when away from her home, and it was only after lead had been detected in the water that lead poisoning was even suspected by the medical attendant, and it then became evident that the patient was suffering severely from lead poisoning, all the symptoms being strongly marked. The gums were tinged of a bluish shade, and the fingers of both hands had become stiff and partially paralyzed.

The house referred to was supplied from a well about 500 yards distant, the water passing by gravitation through a 1-inch lead pipe; and although this pipe had been in use for 21 years, and the water which passed through it contained certain proportions of sulphate and carbonate of lime, yet the pipe had not become coated, as Mr. Belgrand says is the case with lead pipe in Paris, and as is generally supposed to be the case; but was, according to the description of the owner of the house, as free from inside coating when taken out as it was when put in.

I was asked to suggest a substitute for the lead pipe, and advised the use of tin-lined lead pipe, where the coating was about 1-16th to 1-20th of an inch thick, because some samples which I had obtained and examined several years before did not in the slightest degree contaminate water when kept in the pipe for many days. My suggestions were carried out, and a sample of the water which had passed through this tin-lined pipe sent to me for examination. I found it to be contaminated with lead to a considerable extent; and on examining some of the tin lining I found it to contain a large proportion of lead. I sent to another manufacturer of this tin-lined pipe for a sample. This he sent me; and I again found that the tin lining contained a large proportion of lead, and quickly contaminated water left in contact with it. This I communicated to the manufacturer, who informed me that he could not understand how the tin lining had become contaminated, unless it was by its being poured down the side of a strip of lead into the hole left in the solidified lead in the cylinder previous to forcing it through the dies by hydraulic pressure.

As I understand, this pipe is produced by pouring melted lead into a cylinder, through the top of which an iron shape is introduced to make a cavity in the lead of sufficient size to hold the necessary quantity of tin; the lead is then allowed to set; when this occurs the iron shape is withdrawn and molten tin poured in to fill the space which the iron shape previously occupied. A die, composed of an iron tube with a core, dips into the tin, which remains liquid in the cavity, whilst this outer tube forms the core of another tube through which lead is forced, the innermost core being prolonged, so that the tin comes in contact with and solidifies on the interior of the lead pipe.

It seemed to me remarkable that a manufacturer who was cognizant of the fact that tin dissolved lead should have allowed such a device as the pouring of tin down a strip of lead to be employed for filling the mould.

These tin-lined pipes, I understand, are used to a large extent, and principally in making communication between the beer in the cask and the pump on the counters of beer retailers. Such pipes would give the idea of safety, but it is clear that many samples of it may be of such a nature as to contaminate beer with lead to a large extent, as the beer contains a certain amount of free acid, which would in all probability be capable of dissolving the lead; and one would expect that the person who consumes the first glass of beer from the pump in the morning would get that which had remained over night, and would imbibe, therefore, a considerable quantity, depending on the quality of the lining, of the poisonous metal.

To test whether this was really the case, a few days ago I got two samples of beer, drawn in the morning, from two pumps at the same place, and examined them. I found a considerable proportion of lead to be present in each.

To find whether it was possible to obtain tin-lined lead pipe in which the tin was free from lead, for making communication between the house and well above mentioned, I obtained a number of samples of this variety of pipe from the same and from different manufacturers, and tested the purity of the tin lining inside each, but failed to find one which was not contaminated with lead, and which did not contaminate water when left in contact with it for two or three days, to a greater or less extent. One or two samples, however, contained very little lead, and only caused a minute trace of contamination in

the water; but the majority contained a large percentage of lead, and polluted the water to a great extent.

Ultimately the gentleman who occupied the house referred to had the tin-lined lead pipe, which replaced the lead one, dug up, and communication with the well established by 500 yards of block tin pipe; and since this change was made, he informed me lately that his family have enjoyed good health.

There is another kind of lead pipe manufactured, called "tinned lead pipe," the inside of which is covered with a very thin coating of a white metal, to afford protection against the action of water on lead. As a matter of fact, this coating is not tin at all. It is produced by filling the first few inches of the ordinary lead pipe which is forced through the dies, whilst still very hot, with molten tin, which remains molten and washes the inner surface of the lead tube as it is produced. Presumably, when a long length of pipe has been forced through the dies, there would be little or no tin remaining; but I am informed by a manufacturer of this pipe that this is not the case; on the contrary, there is a much larger volume of tin, to use his own language, at the end of the operation than there was at the beginning—the molten tin dissolves the lead, thus increasing in volume. And so the coating is a mixture of lead and tin, the proportion of lead in the coating being greater in those portions of the pipe which are last forced through the die.

Some years ago, not knowing of the existence of this kind of tinned lead pipe, I requested a plumber to make for me a worm refrigerater with tin-lined lead pipe, for the preparation of distilled water. He did so; and to my astonishment, on testing the distilled water which had been distilled in it, I found it to contain a large proportion of lead. On examinination of the pipe afterward, I found it to be the variety which had been washed with tin. This coating cannot, therefore, be regarded as a thoroughly efficient protection against the action of water on lead; but the test was a severe one, and there can be no doubt but that tin-coated lead pipe is much better adapted for use in making communication with the water mains in large towns than the ordinary lead pipe, whilst the cost of producing this coating, I understand, amounts to only a few shillings per ton of pipe.

To test their respective values, I placed water containing a small proportion of nitrate ammonia in two pipes of the same size, the one tinned inside, the other the ordinary lead pipe. After standing about three hours I tested the water from each. The one from the tinned lead pipe contained only a trace of lead, whilst that from the ordinary lead pipe contained a large proportion of lead in solution. Similar results were obtained by leaving Manchester water in the same pipes for eighteen hours.

It is a fact, which I have observed from my experience during the last few years, that aerated waters are contaminated with lead much more often, and in many cases to a much greater extent, than one would expect, considering the attention and care which is bestowed by good firms on the manufacture of these articles. Lately I tested several samples of what was termed "pure" carbonate of potash, and "pure" carbonate of soda, and citric acid, which were specially purified for use in the preparation of aerated waters; and I found all to be contaminated with lead to a greater or less extent. The manufacturer of these samples was apprised of this fact, and in reply he admitted that they contained traces of lead, but said it was impossible to obtain these substances free from metallic contamination at anything like reasonable cost, and he was quite satisfied that the quantity was not objectionably large. To overcome this difficulty I had to advise the use of the ordinary carbonate of soda, made by Solvay's ammonia process, as being almost as pure, and certainly much less likely to be injurious, than the purified salt. I also advised that those salts which it is impossible to obtain free from lead should be dissolved in water and filtered through or boiled with animal charcoal, which has the property of removing the lead from solution. It might here be noted that the use of charcoal filters diminishes very much the risk of lead poisoning, as the charcoal removes any trace of lead which the water might contain.

It was first discovered and afterward published by the late Dr. Grace-Calvert and Mr. Richard Johnson, in a joint paper, that pure lead is more easily acted on by sulphuric acid than lead containing a very small percentage of impurities, such as antimony and copper; and these results have been repeatedly verified since. With a view to find the effect of pure water on lead to which I added three-quarters of one per cent. of antimony, I melted some of the original lead and poured some out, which I rolled into a sheet. Antimony was added to the remainder, and the mixture poured out and rolled into a sheet as before; both sheets were cut to the same size and placed in equal bulks of distilled water, and left over night. In each case a fine white floculent crystalline matter, an oxide or salt of lead, was observed in suspension; but this existed in considerably greater proportions in the water containing the lead which had not been treated with antimony. Thus the small quantity of antimony appears to afford some protection against oxidation of the lead by air and water. When the suspended matter was filtered off only a trace of the lead was found to be in solution in each case.

It is sometimes advisable to obtain the lead contained in water in a contracted solution, and preferably in an acetic acid solution if possible. I have observed frequently that weak acetic acid dissolves no lead from the residue left on evaporating waters which gave originally a very distinct coloration with sulphuretted hydrogen; but on treating the residue with strong nitric acid, evaporating off the acid completely, and again treating the residue with weak acetic acid, the lead dissolves with apparent facility, and on evaporating this acetic solution of the metal to a drop or two, it may be obtained in a sufficiently concentrated solution for the application of the other tests. It appears as if certain organic matters contained in the water combine with and render the lead insoluble in acetic acid; these organic substances being afterward decomposed by the nitric acid, leave the lead in a condition in which it is soluble in acetic acid.

The Preparation of Artificial Fuel.

For years past great attention has been given to the devising of methods for the preparation of coal dust into forms suitable for combustion. No great measure of positive success has yet been attained in this direction, although considerable progress has been made. Messrs. Newhaus and Heniger, of Berlin, according to the *Coal Trade Journal*, claim to have perfected an apparatus which serves not only for the performance of the preliminary operations for the pressing of coal dust into the required shape for use as fuel, but can also be used by itself without being connected with the press, to bring the combustibles into a suitable form for facilitating the liberation of their gases.

The chief operations required in the manufacture of artificial fuel consist in drying the combustible, in developing the tar contained in it, and, finally, in compressing the fuel. These are performed in heated and rarefied spaces in special apparatus. The contrivance of the above-named gentlemen is provided with a hopper, in which the combustible is placed after having been previously reduced to a finely-divided state. This careful reduction is, of course, only necessary when it is intended to compress the material afterward into patent fuel, and can be dispensed with when the material is simply to be dried for the purpose of driving out the gases. The hopper opens, by means of a neck at the bottom, into a horizontal cylinder provided with double walls, which can be replaced by a double walled trough, in which a worm is placed slightly below the center. By turning this worm, the pulverized material is driven from the closed end of the cylinder to the other end, which is open, and finally falls into a reservoir, which is also double walled and is open at the bottom. The spaces formed by the double walls of the horizontal cylinder and reservoir, which are tightly closed all around, are in direct communication with each other by means of a connecting pipe. The heating of the apparatus is produced by introducing steam from the driving engine, thus drying the combustible contained in the horizontal cylinder and reservoir to a certain extent. Steam can also be taken from a boiler specially erected for this purpose. The long axis of the reservoir is placed nearly or quite vertical, in order that the material to be further acted upon may fall by its own weight into the drying space below. For this purpose the bottom attached to the inner wall of the reservoir is arranged so as to incline downward, and terminates in an open neck (capable of being closed by a slide valve) to which the outer wall is attached.

The part of the apparatus thus far described serves merely as a preliminary dryer. The special drying apparatus is arranged underneath it, and can be placed in communication with the preliminary drying apparatus by means of a movable funnel. Should it be desired to convey the material preliminarily dried into the special drying apparatus, this funnel is pushed in between the latter and the above-mentioned neck of the reservoir, and the slide valve is drawn back. The material then falls upon a second and lower slide, which closes the upper end of a vertical cylinder of the special drying apparatus. This cylinder is also provided with double walls. Steam taken in a boiler is driven through the tightly closed case formed by these double walls, being admitted and allowed to escape by means of two pipes placed at the upper and lower ends respectively.

The interior of the vertical cylinder above the steam casing is in communication with a separate chamber by means of a special connecting pipe, in which the vapors constantly developed by the highly heated material in the vertical cylinder are immediately condensed. In addition to this, a partial vacuum is produced by which the mechanical emptying of the vertical cylinder is facilitated, and by means of which all the air which may possibly be contained in it is removed. The air pump provided for this purpose also serves to remove the steam from the vertical cylinder, and this, combined with the condensation, forms the special characteristics of the process. In order to ascertain whether the material is sufficiently dry to be compressed, a sort of hygrometer is attached to the connecting pipe of the condenser. A second pipe is placed at the side of this connecting pipe and leads to a pulley frame, in which an axle is placed, provided with a lever, to which a catgut is fastened. The other end of this catgut is attached to a screw on the outside of

the communicating pipe, and which can be suitably set by means of a thumb-screw. The catgut can thus be easily stretched to the required extent. The end of the above-mentioned axle, which projects out of the pulley frame is provided with a pointer and a suitably-placed spring, and the alternate contraction and expansion consequently acts on this spring, causing the pointer to change its position. After the material has been sufficiently dried and freed from air it is placed in a reservoir and subjected to pressure. A larger quantity of the combustible than the process can work should, of course, be supplied in order that the operation may not be brought to a standstill, and the drying reservoir is therefore usually not empty when fresh material is brought from the vertical cylinder.

The main advantages of the process are that the small coal is dried in a heated and rarefied space, and that the temperature is kept uniform during the drying process, notwithstanding the constant addition of new material and the consequent absorption of heat. The space allowed for the expansion of the vapors formed in the upper part of the condenser is, moreover, exceedingly small, because if this were not the case the action of the condenser and of the air pump would be impeded by the powerful expansion. The size of the drying apparatus, and also of the condenser and air pump connected therewith, is regulated by the quantity of the production in each case. The formation of tar can be effected while the fuel is in the drying cylinder, its principal development, however, taking place when the materials are worked for the purpose of making patent fuel in hot press molds, as a result of the pressure required to bring it into the desired shape. The tar is here the exclusive binding material of the mass by which its formation into fuel is rendered possible.

A press of any already improved construction may be successfully employed, the chief condition being that the pressing takes place in a rarefied chamber in order that compact masses of fuel without air spaces may be produced. The mass subjected to this treatment does not come into contact with the outer air until it is thrown out in the form of finished bricks. The fuel, as has been stated on previous occasions, has been used in many instances with highly satisfactory and economical results, and further improvements in the different processes heretofore introduced will undoubtedly take place in the near future.

The London Gas Companies.

The publication, in a complete form, of the accounts of the London gas companies for 1881, affords a fitting opportunity for comparing the results obtained by the several companies during the past year with those realized in the previous twelve months, besides furnishing the public with an important and comprehensive statement, illustrative in many respects of the conditions of the metropolitan gas supply. The value of the return, so far as it offers facilities for comparison, is certainly very different from that which it possessed a few years ago. Time was when the Imperial, the Ratcliffe, the Independent, the Phœnix, and the Surrey Consumers' were all included in the list of companies whose operations were dealt with ; but as the result of amalgamations these undertakings have from time to time ceased to exist. The Crystal Palace District Company is now generally considered a London concern, but it has never been included in these returns, and the figures given on the present occasion, therefore, relate to only four companies—viz., the Chartered, the Commercial, the London, and the South Metropolitan. If rumor is at all to be relied upon this number bids fair to be very shortly reduced to three, and our readers will doubtless be able to estimate for themselves the extent and real character of the competition that will then, and even now, prevails. The total capital employed by the four companies named above amounted to £13,173,417, or £147,462 more than in 1880. The Chartered Company, of course, comes first, with £9,519,943 ; the South Metropolitan follows, with £2,041,922 ; the London is third, with £865,805 ; and the Commercial Company has the smallest amount—£745,845. If regard be had, however, to the capital per ton of coal carbonized, the order is very nearly reversed. The Commercial ranks first, with £4 14s.; then comes the South Metropolitan, with £5 1s. 10d.; the London again occupies third place with £5 6s. 11d.; the Chartered in this instance being last with the high figure of £7 10s. 10d. The average capital expenditure of all the companies per ton of coals carbonized was just upon £6 12s. 9d., which is nearly 4s. 5d. less than during the previous year. With the exception of the South Metropolitan, who show a slight increase, a diminution under this head is indicated in each case, and there can, we suppose, be little doubt that, but for its amalgamation with the Phœnix and the Surrey Consumers' Companies, the South Metropolitan would have occupied a very different position. The old Phœnix Company, if we remember rightly, was particularly heavily burdened in this respect.

The gross income of the companies from all sources was £4,018,404, showing an advance of £25,105, as compared with the previous return, while the receipts by the sale of gas by meter, which amounted to £2,736,395, were no ess than £53,274 below those of 1880. The decline in the income under this latter head appears to have been common to all the companies, and is attributed to reductions in the price of gas ; in the case of the South Metropolitan the diminution was to the extent of£27,163. On the other hand, residual products yielded to the four undertakings an increased revenue of £78,046, the total receipts for residuals last year amounting to £986,575. It is worthy of notice, however, that while the South Metropolitan shows an advance in its income under this head of £32,098, the Chartered although doing three or four times as much business, can only boast of an increase of less than £30,000.

It is further deserving of remark, that in the case of the first mentioned company the receipts for residuals amounted to 10s. 6d. per ton of coals carbonized, while in the case of the Chartered the amount was less than 9s. 9d. These figures certainly do not convey the impression that the enormous expenditure which has been incurred by the Chartered Company at Beckton in providing works and plant for manufacturing its products has proved particularly remunerative, especially when the Commercial and London Companies can show a return of 10s. 4d. and 9s. 8d. per ton respectively. The total expenditure of the four companies on revenue account has risen from £2,699,614 in 1880 to £2,809,502 in the past twelve months, indicating an increase of just upon £110,000. Coals cost £77,000 more, while rents, rates and taxes show an increase of over £31,000, and wear and tear (manufacture) absorbed an additional amount of £31,131, the Chartered figuring in respect of each item for considerably more than its fair share of the total increase shown. Indeed, towards the difference of £109,888 between the gross expenditure of 1880 and 1881, the Chartered contributed no less than £106,711, and the gross profit in the case of this company was in consequence some £89,000 less.

The total charges for directors and auditors show a decline of £18,330, this being the amount that appeared in the accounts of the South Metropolitan Company for 1880 as having been paid as compensations to directors and auditors under amalgamation schemes. The general result of the year's trading was that a gross profit was earned by the companies of £1,208,901, representing a return of £9 3s. 6d. per cent. on capital and borrowed money. The Commercial Company appears to have done best, showing a return of £12 7s. 5d. per cent. The South Metropolitan takes second place, with £11 7s. 5d.; the London follows, with £8 10s. 6d.; and the Chartered last, with a gross profit of £8 10s. 4d. per cent.

There are, of course, numerous other points in the accounts before us to which we would desire to call attention ; but having alluded to the salient features, we are compelled by the exigencies of space to defer any detailed references until a future occasion.—*Metropolitan.*

The Franklin Institute and the Proposed Change in the U. S. Patent Laws.

A special meeting of the Franklin Institute was held in the Hall of the Institute, on the evening of May 24th. The subject which occasioned the call for the gathering was the proposed action of Congress in relation to the patent laws. The designation and text of the bill referred to, as also the proceedings of the special meeting of the Institute in relation thereto, are given herewith—

"An Act to amend section 4919 of the Revised Statutes, relating to the recovery of damages for the infringement of patents.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no action for damages or proceeding in equity shall be sustained, nor shall the party be held liable under sections 4919 and 4921 of the Revised Statutes of the United States for the use of any patented article or device, when it shall appear on the trial that the defendant in such action or proceeding purchased said article for a valuable consideration in the open market."

The President, *pro tem.*, Mr. Hector Orr, called attention to a copy of bill printed in large characters and suspended in the Hall for convenience of reference, and invited a free and full expression of opinion preparatory to taking definite action in relation to it.

The subject was thereupon discussed in all its bearings *pro* and *con.*, by the following gentlemen, namely : Thos. Shaw, Geo. R. Moore, William B. Cooper, Prof. E. J. Houston, Amos Stevens, C. F. Reed, Cyrus Phillips, A. de Beaumont, C. H. Chorman, J. E. Mitchell, Henry R. Heyl, and G. M. Eldridge, the prevailing sentiment among the speakers being that of strong opposition to the proposed amendment to the patent laws.

At the close of the discussion Mr. Heyl moved that a committee of three be appointed by the chair to express the sense of the meeting on the subject. The motion was carried, and the following members were named to constitute the committee, viz.: H. R. Heyl, Thos. Shaw, and G. M. Eldridge.

The committee, after a brief deliberation, presented the following preamble and resolutions—

"*Whereas*, By the vote of the House of Representatives of the United

States, taken on the 15th day of May, 1882, a bill was passed to amend the United States Patent Laws—which amendment takes away almost entire protection granted by letters patent to property acquired by invention, and in effect legalizes theft; and

"*Whereas*, It is manifest that any such enactment as will relieve the possessor of a fraudulently made article from all liability as a party to the infringement, will render the protection heretofore guaranteed by letters patent as utterly inadequate as though no patent existed; and

Whereas, The unparalleled advances that have been made by this nation in every department of science and industry are due solely and unquestionably to the wise provisions of our patent laws, and all legislation that in any degree detracts from the protection now afforded to inventors would paralyze all the industries which by protected ingenuity have become monuments to American progress, and sources of incalculable wealth to the nation;

"*Resolved*, That it is the sense of the Franklin Institute, of the State of Pennsylvania, for the Promotion of the Mechanic Arts,

"That the amendment to section 4919 of the Revised Statutes relating to the recovery of damages for the infringement of patents, which passed the House of Representatives May 15th, 1882:

"It is a violation of the rights ensured to the holders of patents under the laws of the United States;

"Is a deprivation of the remedies which are essential to the maintenance of those rights;

"Is a breach of the contract with patentees made by laws relating to patents;

"Is injurious to the interests of inventors and patentees, with no compensating advantages to any other honest persons;

"And is destructive of the system of patents in the United States, which has done more than any other one thing for the promotion of the mechanic arts and the advancement of the material interests of the country."

On motion of Mr. Chormann, the preamble and resolutions were adopted.

On motion of Mr. Addison B. Burk, it was resolved that a committee of three be appointed to proceed to Washington, at the proper time to lay the resolutions before the Senate Committee on Patents, and to represent the sentiment of the meeting. The chair named the following members to serve on the committee, viz.: Messrs. Thomas Shaw, Prof. Houston and G. M. Eldridge.

It was further resolved, on motion of Mr. J. E. Mitchell, that the preamble and resolutions just passed be printed, and that a copy be sent at the earliest possible moment to each Senator and Representative in Congress.

Finally, it was decided, on motion of Mr. Eldridge, that the officers of the Institute be instructed to send an officially certified copy of the preamble and resolutions to the President of the Senate and to the Speaker of the House of Representatives.

An Incandescent Gas Light.

A late number of London *Iron* contains the following description of what it terms an "incandescent gas light"—

It is now about three-quarters of a century since the process of gas manufacture was established for the production of light by the destructive distillation of coal, and it is a remarkable fact that whilst the process itself has been greatly developed, it is only since the introduction of the electric light that any considerable improvement has taken place in the application of gas as an illuminating agent. Were the electric light to do nothing more than it has done in stirring up gas engineers and manufacturers to a conviction that they must improve the means of burning as well as of manufacturing gas in order to compete with the new comer—electricity—it will have served a very useful purpose. There is, however, every reason to believe that both electricity and gas will run side by side for many years to come; the electric current being laid on and supplied to the public by meter in the same way as gas at the present time, and there is ample room for both. Now light is produced by the incandescence of solid matter, whether it be from electricity or gas. If from electricity, and by the arc lamp, it is the combustion of carbon which produces the light; if by means of an incandescent lamp, it is by the incandescence of the carbon filament. If from coal gas, it is the carbon in it, which is rendered incandescent by hydrogen, and the same principle governs the production of light from whatever source obtained.

In referring to an incandescent lamp, the mind immediately associates itself with electricity; but a new rival of electricity has appeared in the form of an incandescent gas lamp, which consists simply of a platinum cage, rendered incandescent by the combustion of gas and air under pressure. The invention is due to Mr. James Lewis, and we have recently examined the light at the works in Channing's buildings, Clerkenwell Green, and the light produced was certainly very astonishing. With a registered consumption of only 10 cubic feet of gas per hour, the light appeared to be fully double that obtainable from the same amount of gas consumed in the best argand gas burner.

The light is produced in the following manner, and its distinguishing feature is its extreme simplicity, which will commend itself to everyone who sees it. The burner is composed of two pipes, one for supplying air at a pressure about sufficient to balance a 6-inch column of water; and the other, gas, obtainable in the ordinary way. On the top of the burner is placed a cap or thimble, about two inches high and half an inch in diameter, and formed of fine platinum wire gauze. The air under pressure is delivered from an inner tube opening into a larger one near the top of the burner, with an opening at the lower end to the atmosphere; and when the compressed air is turned on an induced upward current is produced, through the lower end, and gas being admitted at the same time the mixture of gas and air passes into and through the platinum thimble, and being there ignited, the thimble becomes in a few seconds a column of incandescent light of high illuminating power. The light is remarkably steady, and its cost is stated to be much less than that of coal gas burned in the ordinary way. Another important feature is that the combined air and gas is so acted upon by the intense heat of the wire gauze that perfect combustion is effected, as was demonstrated on the occasion of our visit by the perfectly clean condition of a polished plate after it had been held over the burner for some time. The amount of heat developed, moreover, is very small as compared with an Argand burner consuming the same quantity of gas per hour. Arrangements are being made to light the streets from Clerkenwell Green to the Angel, Islington, on Mr. Lewis's principle. The air will be compressed at the works at Clerkenwell Green, and will be supplied though a main laid down in the thoroughfares. The burners will be placed in shadowless lanterns. It will also be arranged that the inhabitants of the houses on the route can be supplied with compressed air from the main, just as they now are with gas, which will enable them to adopt the new system. The public will therefore shortly have an opportunity of testing the system and of judging of its merits, which certainly appear to be very great. The results, so far, promise well for the future of both the invention and of illumination by means of coal gas.

Regulating the Standard of Illuminating Oils in the State of New York.

The following late statute regulating the standard and sale of petroleum and kindred oils in the State of New York will be of interest:

Sec. 1. No person, company, or corporation shall manufacture or have in this State, or deal in, keep, sell, or give away, for illuminating or heating purposes in lamps or stoves within this State, oil or burning fluid, whether the same be composed wholly or in part of naphtha, coal oil, petroleum, or products manufactured therefrom, or of other substances or materials, which shall emit an inflammable vapor which will flash at a temperature below 100° by the Fahrenheit thermometer, according to the instrument and methods approved by the State Board of Health of New York.

Sec. 2. No oil or burning fluid, whether composed wholly or in part of coal oil and petroleum, or other substance or material, which will ignite at a temperature below 300° by the Fahrenheit thermometer, shall be burned in any lamp, vessel, or other stationary fixture of any kind, or carried as freight in any passenger or baggage car, or passenger boat moved by steam power in this State, or in any stage or street car drawn by horses. Exceptions as regards the transportation of coal oil, petroleum and its products, are hereby made when the same is securely packed in barrels or metallic packages, and permission is hereby granted for its carriage in passenger boats moved by steam power when there are no other public means of transportation. Any violation of this act shall de deemed a misdemeanor, and subject the offending party or parties to a penalty not exceeding $300, or imprisonment not exceeding six months, at the discretion of the court.

Sec. 3. It shall be the duty of the State Board of Health of New York to recommend and direct the nature of the test and instruments by which the illuminating oils, as hereinbefore described, shall be tested in accordance with the act. It shall be the duty of the public analysts who may now be employed by the State Board of Health, or who may be hereafter appointed, to test such samples of suspected illuminating oils or fluids as may be submitted to them under the rules to be adopted by said Board, for which service the said Board shall provide reasonable compensation at the first quarterly meeting of the State Board of Health held after the passage of this act; it shall adopt such measures as may seem necessary to facilitate the enforcement of this act, and prepare rules and regulations with regard to the proper methods of collecting and examining suspected samples of illuminating oils, and the State Board of Health shall be authorized to expend, in addition to all sums already appropriated for said Board, an amount not exceeding $5,000 for the purpose of carrying out the provisions of this act. And the sum of $5,000 is hereby appropriated out of any moneys in the treasury not otherwise appropriated, for the purpose of this section.

Sec. 4. Naphtha and other light products of petroleum which will not

stand the flash test required by this act may be used for illuminating or heating purposes only:

(*a.*) In street lamps and open-air receptacles apart from any building, factory, or inhabited house in which the vapor is burned.

(*b.*) In dwellings, factories, or other places of business when vaporized in tanks or metallic generators made for that purpose in which the vapor so generated is used for lighting or heating.

(*c.*) For use in the manufacture of illuminating gas in gas manufactories, situated apart from dwellings and other buildings.

SEC. 5. It shall be the duty of all district attorneys of the counties in this State to represent and prosecute in behalf of the people, within their respective counties, all cases of offences arising under the provisions of this act.

SEC. 6. Nothing in this act shall be so construed as to interfere with the provisions of the laws of 1871 as regards the duties of the bureau of combustibles of the city of New York, or any other statutes not conflicting with this act: *Provided*, That nothing in this act shall not be deemed to interfere with or supersede any regulation for the inspection and control of combustible materials in any city of this State made and established in pursuance of special or local laws or charter of said city.

London Water Supply.

J. F. D. Firth, M.P., contributed the following on this subject to *House and Home*. He writes:

The average amount of water delivered by the companies in 1880 was 142,000,000 gallons per day, being an increase of nearly 8,000,000 gallons on 1879. Of this amount, more than 71 millions gallons were, we are informed, sometimes "grossly polluted by sewage matters." More than 61 millions gallons were "occasionally so polluted," and less than nine millions gallons were uniformly of excellent quality for drinking. These figures are an eloquent condemnation of the policy of purchasing, at an exorbitant rate, so imperfect a supply. It is noted that the impurity is increasing, and was greater, both proportionately and actually, in 1880 than during any year since the analyses began in 1868.

Dr. Frankland also states that the water of the Thames and the Lea is becoming every year less suitable for domestic use. This condition of things is most serious, as is admitted on all hands that the supply of water is essentially a municipal function. It is an article of prime necessity, and upon its pure and sufficient supply depends in a large degree the health of the town. Under various Acts of Parliament, ending with the Metropolis Water Act, 1871, the water companies are subject to public control, and they have expended large sums of money in completing systems of filtration, but from the nature of the river water with which they have to deal the result has always been unsatisfactory, and—as the Rivers Pollution Commissioners say—no process has yet been devised of cleansing water once contaminated with sewage so as to make it fit for drinking.

If, therefore, the citizens of Greater London purchased the existing water supply, one of the first duties of the purchasing authority would be to initiate a fresh supply for potable purposes.

Weight of Charcoal.

Mr. A. L. Tyler, of the Woodstock Iron Company, of Alabama, gives the following data concerning the weight (per bushel of 2688 cubic inches) of charcoal made from various wood:

	Pounds.
Oak	20.92
Mixed oak and pine	19.22
Pine	17.47
Pine (light)	16.82

Transferring these weights to those of bushels of 2748 cubic inches the *Journal* of the Charcoal Iron Workers finds the annexed results:

	Pounds.
Oak	21.38
Mixed oak and pine	19.64
Pine	17.85
Pine (light)	17.19

—*Iron Age.*

Regenerative Furnaces at Birmingham, England.

The Town Council of Birmingham, England, have decided to adopt regenerative furnaces at their Saltley and Windsor street works, in consequence of the favorable report made by the gas committee of the Council to whom the subject was referred. They expect that the use of these furnaces will result in a 50 per cent. increase in the production of the retort houses, not to mention the saving in fuel and labor. The capital required to make the desired change will be but about $23,000.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Hot Scrubbing.

ROCHESTER, N. Y., July 2, 1882.

To the Editor AMERICAN GAS LIGHT JOURNAL:

In your issue of June 16th, containing report of the proceedings of the Western Association of Gas Engineers, Mr. Faben, of Milwaukee, relates his experience with the hot scrubber. Now, as his experience and mine were with the same apparatus, only differing in length of time, and results, it may not be uninteresting to some of your readers to learn what my experience has been.

My trouble with naphthaline began in the years '61 and '62. At about this period I discovered that the inlet to our holder was almost closed up; it was a new substance to me in this form, and at once set me thinking as to how it came there, and how to prevent it from troubling me again. As soon as an opportunity offered I tried condensing at a low temperature; but I soon found that my trouble increased. In trying to remove stoppages caused by it I found that coal-tar naphtha would dissolve it, but that was an expensive and scarce article. Some one advanced the idea that keeping the gas as long as possible in contact with the tar would partially, if not entirely, remove the cause of trouble. This led me to design and construct the apparatus described by Mr. Faben, which was intended to bring the gas, in thin streams, in contact with these small pipes, on which the tar would be deposited, and which could be kept at any required temperature by either water or steam.

In 1875 I erected the apparatus mentioned above at the nearest convenient point to the hydraulic main, and obtained excellent results from it in removing tar. In the spring of 1876 I went to Europe, and, at a meeting of the gas engineers, I had the great pleasure of meeting Mr. William Young, of Clippens, Scotland, whose reputation as a gas chemist is of the highest order. A paper read by him at a previous meeting of engineers led to a discussion on the best means of improving the illuminating power of our gas by utilizing the naphtha produced during distillation of the coal—and here let me recommend all skeptics on the subject of hot scrubbing to read Mr. Young's paper. I think it will convince them not only of the benefit it will be to themselves, but also to their companies and consumers.

On my return to Milwaukee, in the fall of 1876, I immediately turned on steam to what I then called a combined scrubber and condenser; in two days I was surprised at the increase in the candle power of our gas, and supposed the men to be using more cannel than was reported; but, on investigation, I found that this was not the case. I then stopped using cannel, but the illuminating power of our gas still kept up. Now, with regard to naphthaline deposits about the works, and in the street mains. I had been sadly troubled with them every fall, having only 10-inch pipes in the works, and only one 10-inch main that could be relied on to supply the city with 450,000 cubic feet in the long nights. Two or three days after converting our scrubber condenser into a hot scrubber the pressure fell all over the works, and increased at the office in the city.

After passing the condensers our gas entered a horizontal zig-zag dry scrubber, the openings of which, for the passage of the gas, were one-half inch in width; it was now the season for cleaning this, but, on lifting the cover, it was found perfectly clean—in fact, the pressure gauges showed everything clean from the retorts to the holder.

I had meters taken off and examined, in various parts of the city, but no naphthaline was found in them; and I know it was a subject of remark that there were so few complaints from services that fall.

Mr. Faben's idea is "that it is gas made from rich coals that requires hot scrubbing." Let me once more refer him to Young, and also to Bowditch, who will enlighten him on this subject. That gas made from ordinary coal needs enriching we know, and we further know that there is no better material to do it with than the naphtha wasted in the tar well, and no simpler way of doing it than by passing the gas, as it leaves the hydraulic main, through a hot scrubber at the proper temperature that will eliminate the naphthas from the tar. The principle is correct, and is endorsed by the best authorities in Europe and America; and allow me to say here that one of the best gas engineers in the city of New York endorsed my scrubber, and advised the Milwaukee gas company to allow me to duplicate it.

The one at Janesville was not used as a hot scrubber, but as a scrubber condenser; and I believe the reason it did not do its work was that the gas and tar passed through it at too low a temperature, as one I erected in another works, near the hydraulic main, has given entire satisfaction.

I am very glad in having this opportunity to defend hot scrubbing. I hope this subject will be followed up by those engineers having the chemical knowledge, and opportunity, to do so; and that we will soon get to the end of this terrible bugbear—naphthaline, morning, noon and night.

J. H. W.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

MONDAY, JULY 17, 1882.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
34 PINE STREET, NEW YORK CITY.

JULY 17, 1882.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

Gas Co.'s of N. Y. City.	*Capital.*	*Par.*	*Bid.*	*Asked*
Central	$466,000	50	70	75
Harlem	1,800,000	50	94	96
" Bonds	170,000			103
Manhattan	4,000,000	50	212	215
Metropolitan	2,500,000	100	175	180
" Bonds	658,000		107	110
Mutual	5,000,000	100	92	94
" Bonds, go'd.	900,000	1000	100	104
Municipal	1,500,000	100	175	180
" Bonds	750,000		106	110
New York	4,000,000	100	115	118
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	100	103
Citizens	1,200,000	20	65	70
" S. F. Bonds.	320,000	1000	105	107
Fulton Municipal	3,600,000	100	84	88
Peoples	1,000,000	10	45	—
" Bonds	290,000		104	107
" "	250,000		78	90
Metropolitan	1,000,000	100	62	65
Nassau	1,000,000	25	50	55
" Ctfs.	700,000	1000	93	96
Williamsburgh	1,000,000	50	57	60
" Bonds	1,000,000		100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	—	75
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	—	—
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			38	39
Bonds			107	—
East Boston, Mass	220,000	25	122	128
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	140	144
Halifax N. S	400,000	40	148	150
Hamilton, Ontario	150,000	40	117½	
Jersey City	750,000	20	155	160
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	—	100
Laclede St Louis Mo.	1,200,000	100	112	117
Montreal, Canada	2,000,000	100	168	170
New Haven, Conn		25	132	—
Oakland, Cal			32	33
Peoples, Jersey City			75	80
" " Bds.				
Pittsfield, Mass			120	130
Rochester, N. Y		50	70	80
Wilmington, Del		50	174	...
Yonkers		50	30	32
St. Louis Missouri	600,000	50	250	254
San Francisco Gas-Co., S. Fr'isco Cal.			68	69
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—
Washington, D. C	1,500,000	20	185	200
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D. H. GEGGIE, Secretary and Manager.

"GAS INSPECTOR'S OFFICE, QUEBEC, March 7, 1882.

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N. LEVASSEUR, Inspector."

NEWPORT GAS LIGHT CO., NEWPORT, R. I., March 12, 1882.

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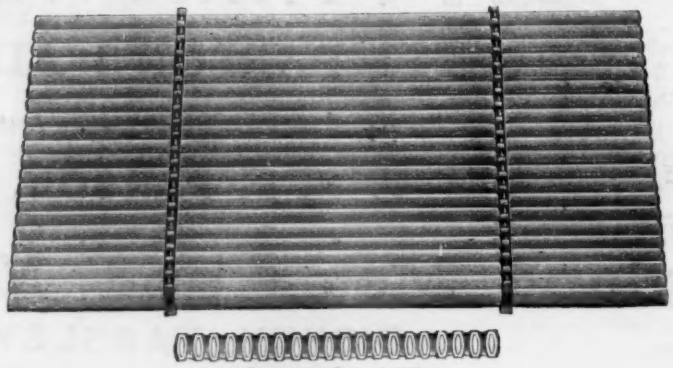

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REFERENCES:—Lawrence Gas Co. Lawrence Mass., Roxbury Gas Co., Roxbury, Mass.; Newport Gas Co., Newport, R. I.

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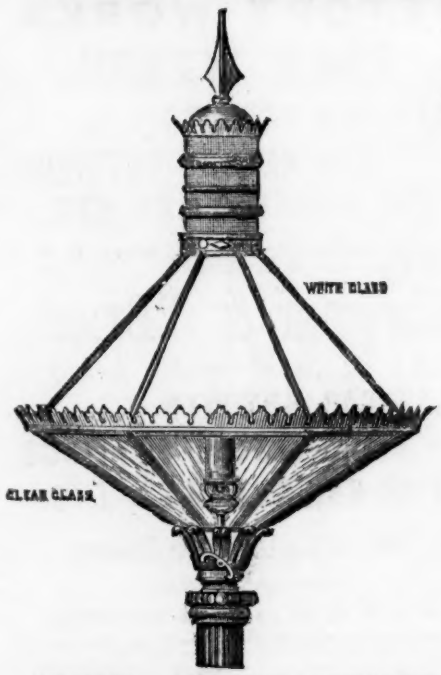

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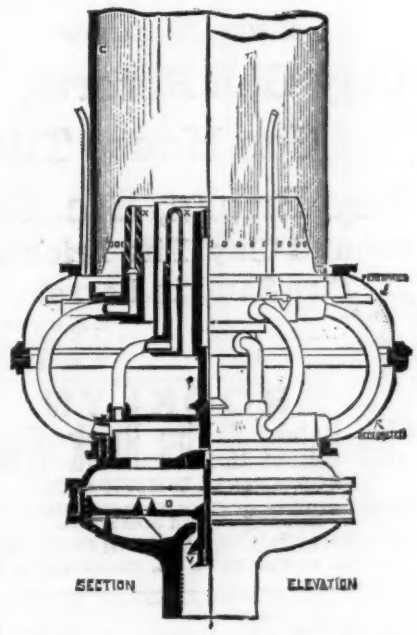

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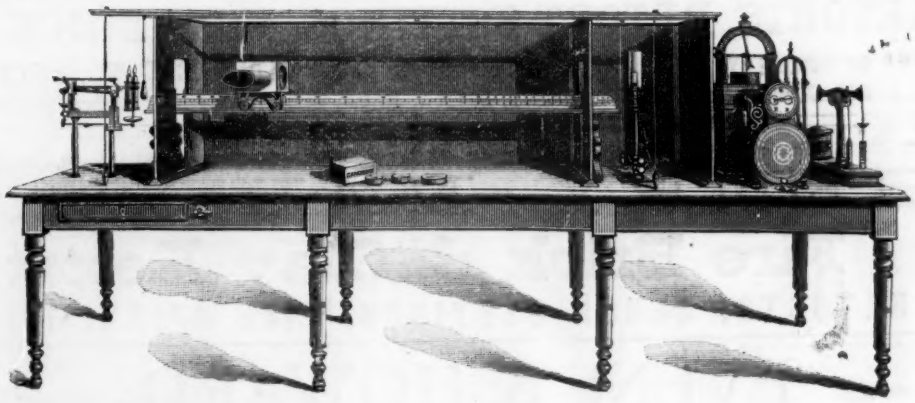

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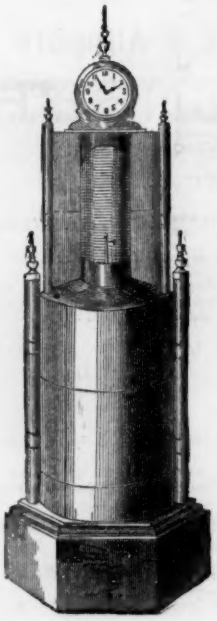

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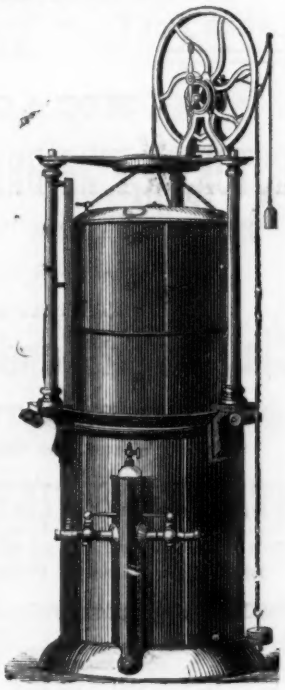

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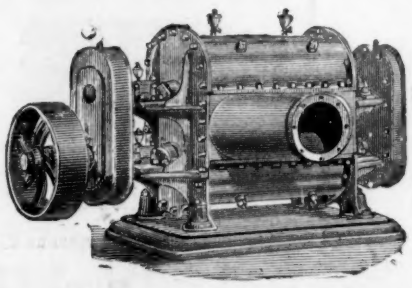

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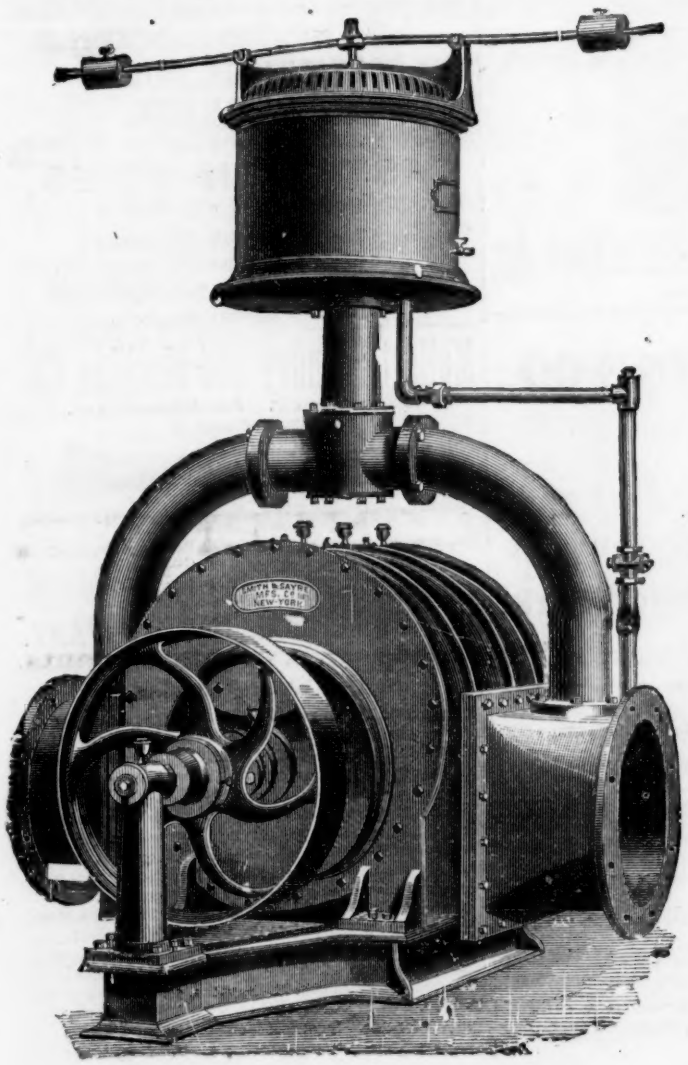

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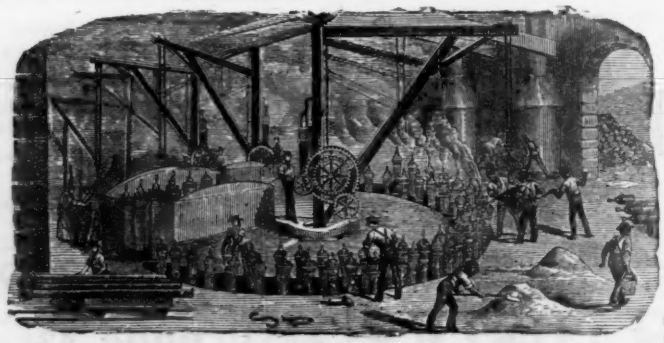

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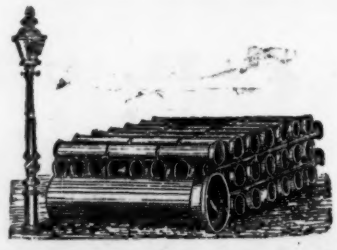

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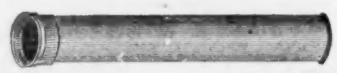

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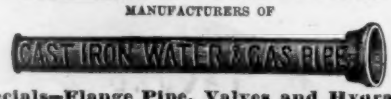

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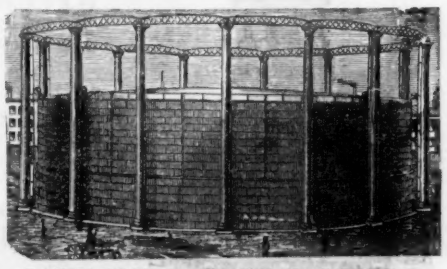

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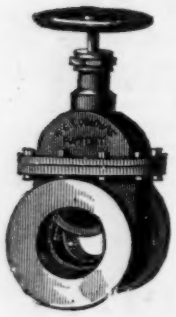

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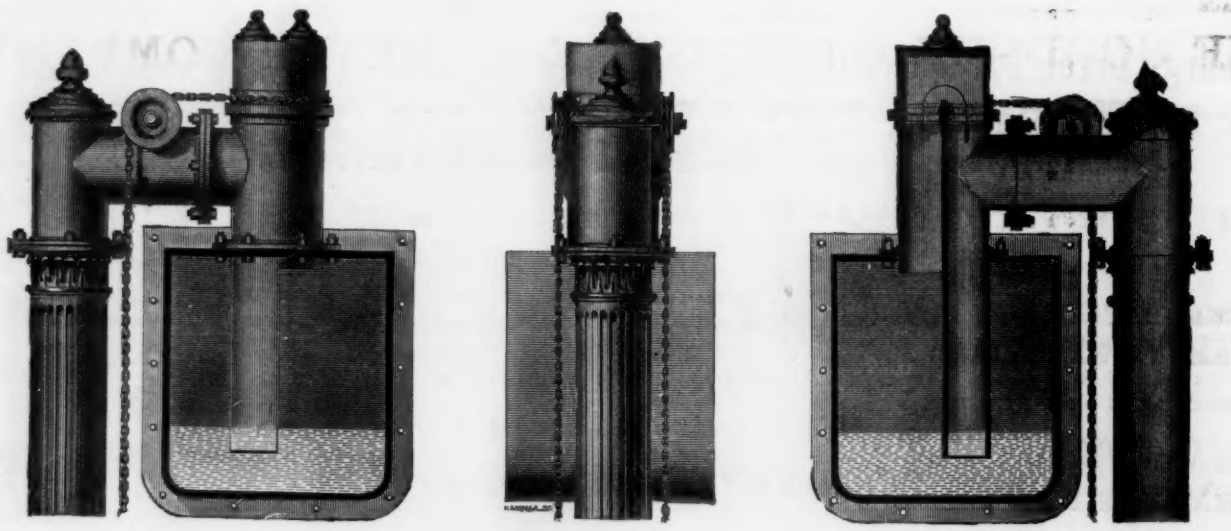

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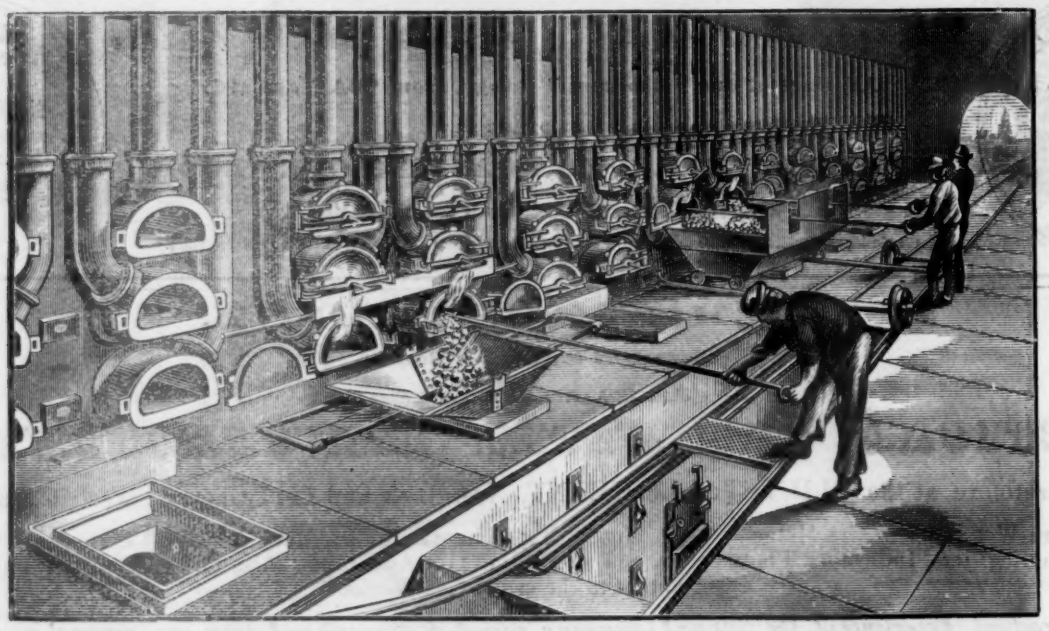

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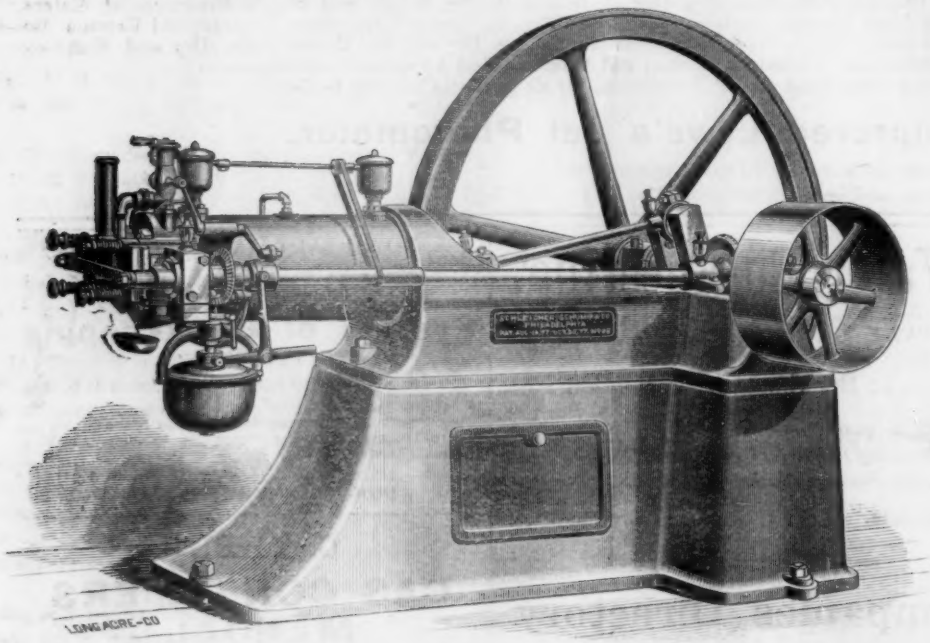

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